Change 1 NAVSHIPS 0967-284-6011

INSTRUCTION SHEET

Change 1 to Technical Manual for Antenna Coupler Groups AN/SRA-56, AN/SRA-57, AN/SRA-58 NAVSHIPS 0967-284-6010

General Instructions:

This change revises the manual to reflect the equipment changes made by installing the interface unit J-3053/SR. When this change is included in the manual, the manual shall cover the equipment as though the interface unit J-3053/SR has been installed in the equipment. This change does not supersede any other changes or corrections.

Maintenance support activities shall make this change in the technical manual immediately, but shall keep the superseded data intact for support of equipments that have not been modified.

Holders of equipment accompanied by technical manuals shall not make this change in the manual until accomplishment of the installation referenced above.

Insert this Instruction Sheet in the manual immediately after the front cover preceding the title page.

Specific Instructions:

1. Remove the following pages and insert the revised Change 1 pages:

REMOVE	INSERT	REMOVE	INSERT
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DATED: 1 June 1971

2. Add the following pages:

Insert	3-12A to 3-12B	between pages	3-12 and 3-13.
Insert	3-16A to 3-16B	between pages	3-16 and 3-17.
Insert	4-8A to 4-8B	between pages	4-8 and 4-9.
Insert	4-42A to 4-42B	between pages	4-42 and 4-43.
Insert	4-64A to 4-64F	between pages	4-64 and 4-65.
Insert	5-14A to 5-14B	between pages	5-14 and 5-15.
Insert	5-28A to 5-28B	between pages	5-28 and 5-29.
Insert	5-98A to 5-98B	between pages	5-98 and 5-99.
Insert	5-102A to 5-102B	between pages	5-102 and 5-103.
Insert	5-110A to 5-110B	between pages	5-110 and 5-111.
Insert	5-120A to 5-120B	between pages	5-120 and 5-121.
Insert	5-122A to 5-122B	between pages	5-122 and 5-123.

3. Delete NAVSHIPS 0967-284-6011 and substitute NAVSHIPS 0967-284-6010 at top of the pages, since basic publication number remains unchanged.

NAVSHIPS 0967-284-6010 *(Non-Registered)*

TECHNICAL MANUAL

for

ANTENNA COUPLER GROUPS AN/SRA-56 AN/SRA-57 AN/SRA-58

DEPARTMENT OF THE NAVY

NAVAL ELECTRONIC SYSTEMS COMMAND

Approved: 27 MARCH 1969
CHANGE 1: 1 JUNE 1971
NAVSHIPS 0967-284-6011

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vii	Original	4-28 to 4-33	Original	5-28A to 5-28B	Change 1
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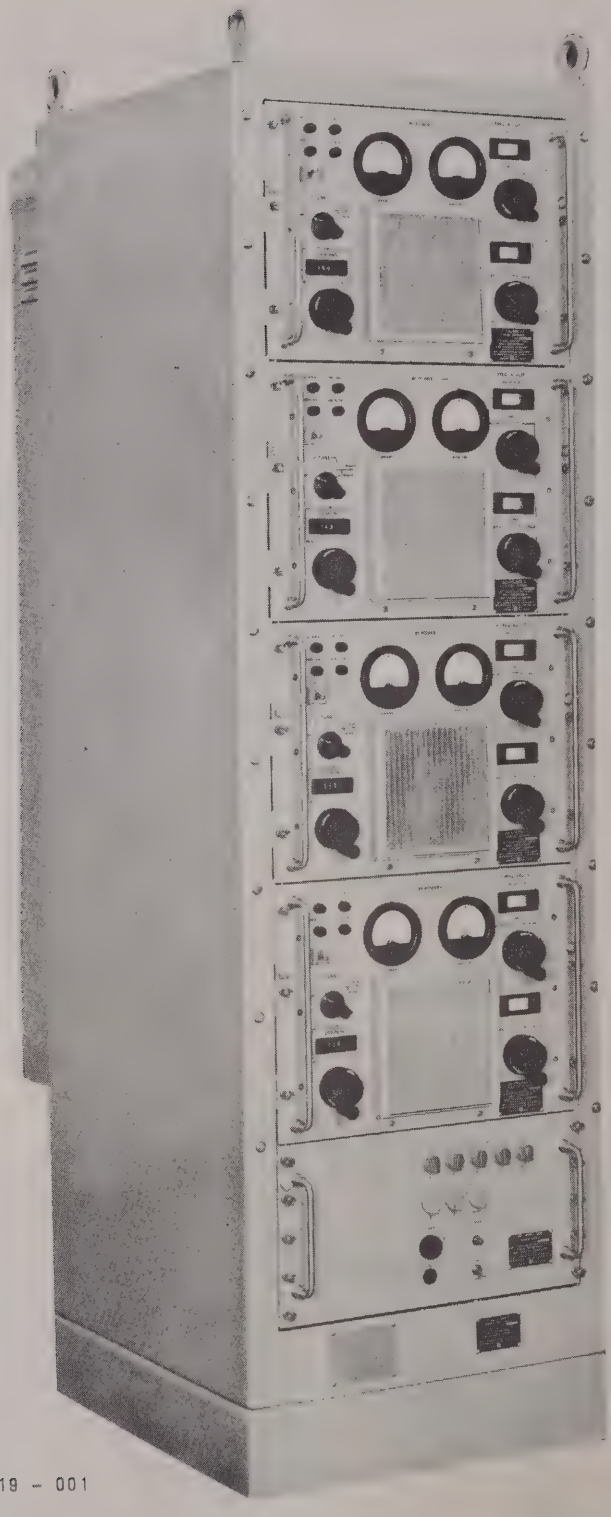


Figure 1-1. Antenna Coupler Group AN/SRA-56, AN/SRA-57 or AN/SRA-58

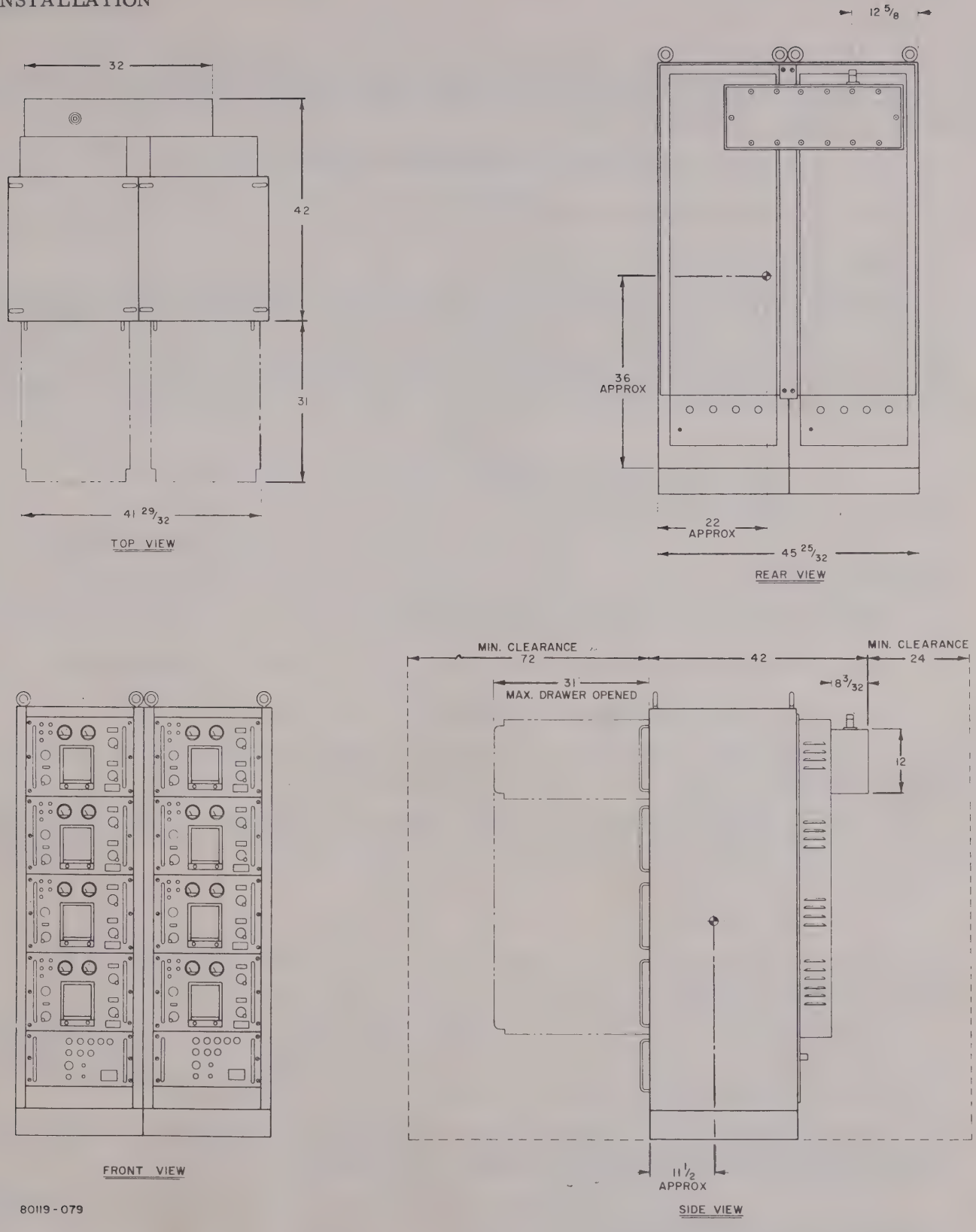


Figure 2-2 Outline Drawing and Minimum Clearance Dimensions for Eight-Channel Configurations for Antenna Coupler Group AN/SRA-56 or -57

Step 6. Insert primary power, NTDS coupler control cables through rear of cabinet (refer to paragraph 2.3.5 for cable information), and make connections at the terminal boards in accordance with figure 5-48.

Step 7. Replace power supply panel in accordance with paragraph 5.3.1.2.

Step 8. Connect all input and output rf cables.

2.3.4 Eight-Channel Configuration Installation

When two coupler groups are combined to form an eight-channel configuration, the equipment cabinets must be joined together by special joining strips and the impedance matching network must be installed. The following are suggested procedures for installing two equipment cabinets to form an eight-channel configuration. When a conflict arises between these suggested procedures and those issued by the Installing Activity, follow the Installing Activity procedures.

Note

Perform inspections and checks in paragraph 2.4.1 before installing impedance matching network.

Step 1. Install the individual coupler group cabinets by following steps 1 through 7 in paragraph 2.3.3.

Step 2. Join the two cabinets at the top and front.

Step 3. For Antenna Coupler Group AN/SRA-57 only, perform the following steps:

a. Remove rear cover from both coupler group cabinets.

b. Remove shorting straps from between receptacle 1A6J1 and inductor 1A6L1, and between capacitor 1A6C1 and top of the output link assembly of both cabinets.

c. Remove the shorting strap from the stowage position on the side of the combiners, and connect the strap from receptacle 1A6J1 to the top of the output link assembly of both cabinets. Place the straps removed in step b in the stowage position.

d. Replace the rear cover of both cabinets.

Step 4. Remove the two lower screws from receptacle 1A6J1 of both cabinets, and join the cabinets at the rear with joining strips.

Step 5. Remove the cover from the impedance matching network, and lift the impedance matching network into place so that connectors 1P1 and 1P2 of the impedance matching network line up with receptacles 1A6J1 of both cabinets. Ensure that the six mounting holes of the impedance matching network also line up with the captive nut holes in the rear cover.

Step 6. With two men holding the network in place, mate connectors 1P1 and 1P2 of the impedance matching network to receptacles 1A6J1 of each cabinet.

Step 7. Install the two mounting screws in the center of the impedance matching network, and then the remaining six screws.

Step 8. On both cabinets, attach one end of the shorting strap to the end of receptacle 1A6J1 with the screws removed in step 4. Attach the other end of the strap to the chassis of the impedance matching network with mounting hardware.

Step 9. Replace the cover on the impedance matching network.

Step 10. Connect all input and output rf cables.

2.3.5 Cable Assemblies

All external cabling is to be run by installation personnel from plans furnished by the Installing Activity. However, the following guidelines should be observed when making cable runs:

a. Although there are no critical lengths applicable to any of the required cabling between transmitters and patch boards, or between patch boards and coupler groups, keep cables as short as is consistent with good installation practice.

b. Support all cables at frequent intervals along the cable run.

c. Observe standard precautions, such as minimum bend-radius, prevention of chaffing, etc., for each individual cable.

Table 2-1 is a list of the cables required for installation of the antenna coupler groups. Note that the length of the cable and the connector at the other end of the cable are as required by the particular installation specified by the Installing Activity.

2.3.6 Interconnections to the NTDS System

The coupler groups require interconnection between the control and alarm circuits of each NTDS equipment, and the associated channel of the coupler group. When these interconnections are made, the transmitters are protected from damage by improper operation of the coupler group, and the coupler group is protected during tuning and operation by removing the rf power to the individual antenna couplers, when required. No modifications to the NTDS equipment are required. Interconnections to the NTDS system are shown in figure 5-48A by control function names on 1A6A8TB1.

2.4 PREOPERATIONAL CHECKOUT

Perform the following procedures before releasing the equipment to operating personnel. Observe all cautions and warnings to prevent damage to the equipment or injury to installation personnel.

2.4.1 Inspections and Checks

Make the following inspections, checks, and adjustments before energizing the equipment for the first time. If the equipment fails to pass any inspection or check, or cannot be adjusted properly, refer to the maintenance procedures in Section 5 and correct the trouble before continuing. See figures 3-1 and 3-2 for location of operational controls.

Step 1. Ensure that all transmitters associated with the coupler groups are OFF, and that primary power (115 vac) to the coupler group is disconnected at the source.

TABLE 2-1. CABLE ASSEMBLIES REQUIRED FOR EQUIPMENT INSTALLATION

TYPE OF CABLE*			ACTIVE CON-DUCTORS	SPARE CON-DUCTORS	CABLES REQUIRED
NAME	DESIG-NATION	CONNECTOR**			
FOUR-CHANNEL OPERATION (ALL GROUPS)					
AC Power Cable	TSGA-3	Ring Terminal	3	0	1
NTDS Coupler Control Cables	MSCA-7	Ring Terminal	6	1	4
Transmitter RF Input	RG-215/U	UG-943A/U	1	0	4
Coupler Group RF Output	RG-18A/U	UG-154/U	1	0	1
Grounding Strap			1	0	1
EIGHT-CHANNEL OPERATION (AN/SRA-56 AND AN/SRA-57 ONLY)					
AC Power Cable	TSGA-3	Ring Terminal	3	0	2
NTDS Coupler Control Cables	MSCA-7	Ring Terminal	6	1	8
Transmitter RF Input	RG-215/U	UG-943A/U	1	0	8
Coupler Group RF Output	RG-319 A/U	Andrew No. 87R	1	0	1
Grounding Strap			1	0	2

* Cables are GFM. Length of individual cables are as required by the particular installation.

** Connectors listed are at equipment end. Connectors at other end are GFM and as required by the particular installation.

Step 2. Visually inspect the exterior of the equipment cabinets for damage.

Step 3. Refer to paragraph 5.3.1.2, and remove power supply panel from each cabinet. Check to ensure that ac power and coupler control are properly connected at the terminal boards in accordance with the interconnection diagram in figure 5-48.

Step 4. Visually and manually inspect all receptacles, plugs, and cables in the base of the cabinet for looseness or damage. Replace the power supply panels.

Step 5. Remove rear cover from each equipment cabinet, and visually and manually inspect all receptacles, plugs and cables to the power attenuator and the individual antenna coupler, all components in the power attenuator, and all combiner components for looseness and damage. Replace rear covers.

Step 6. One by one, open each antenna coupler drawer assembly, and remove top and bottom covers.

Step 7. Visually and manually inspect all components and parts within each drawer for looseness or damage, and for accumulation of dust, dirt, or corrosion.

Step 8. Visually and manually inspect all receptacles, plugs, and cables within each drawer for looseness or damage.

Step 9. Replace top and bottom covers, and secure antenna coupler drawer assembly.

Step 10. Clean and oil all air filters in accordance with instructions in table 5-3.

Step 11. Unlock and rotate OUTPUT COUPLING, FREQ ADJUST INPUT, and FREQ ADJUST OUTPUT controls to check for binding, looseness, or other abnormal conditions.

Note

OUTPUT COUPLING control does not move as freely as the other controls.

Step 12. Mechanically zero all RF POWER FORWARD and RF POWER REFLECTED meters with screwdriver adjustment below each meter.

Step 13. Deleted.

Step 14. Ensure that the rf outputs from the coupler groups are patched or connected to their associated antenna (or ship dummy load).

2.4.2 Preliminary Settings

Verify or establish the following preliminary settings before proceeding with the checkout of the antenna coupler groups (see figures 3-1 and 3-2).

Step 1. Operate POWER ON/OFF switch on the power supply panel of coupler groups to OFF.

Step 2. Rotate TUNE/OPERATE switch on all antenna couplers to OFF.

Step 3. Rotate OUTPUT COUPLING control on all antenna couplers in the maximum DECREASE direction to the stop.

Step 4. Operate EMERGENCY ON/OFF switch on all antenna couplers to OFF.

2.4.3 Energizing the Equipment for the First Time

The procedures given below will establish the operational readiness of the antenna coupler groups. Follow these procedures in the exact order given for all antenna couplers in each coupler group. Do not release the equipment to operating personnel until all procedures have been completed.

2.4.3.1 Control System Checkout

Before applying rf power to the equipment, completely check out the control system in accordance with the following procedures. These procedures ensure that all monitoring, control, and protective devices are functioning properly. Perform the procedures in the exact order given.

Step 1. Refer to paragraph 5.2.1.5.1 and perform all control system checks contained in paragraphs 5.2.1.5.1.1 through 5.2.1.5.1.3.

CAUTION

Do not perform procedures in paragraph 5.2.1.5.1.4 until after calibration procedures in step 2 have been completed.

Step 2. Refer to paragraph 5.2.1.5.4 and perform all control system calibration procedures under that paragraph.

Step 3. Refer to paragraph 5.2.1.5.1.4 and complete the control system check.

2.4.3.2 Operational Checkout

After the control circuits have been checked, calibrated, and found to be acceptable, tune and operate each coupler group in the normal manner to verify that the equipment is operational. Check each antenna coupler at the low, middle and high frequencies of the band over which it operates. For convenience, start the check with antenna coupler (channel) 1A1 and proceed in order through the remaining channels of the coupler group. Perform this check for each antenna coupler in the following manner:

Step 1. In accordance with the applicable technical manual, set each associated transmitter to the lower test frequency given in table 2-2.

TABLE 2-2 TEST FREQUENCIES FOR CHECKOUT OF ANTENNA COUPLER PERFORMANCE

ANTENNA COUPLER	TEST FREQUENCIES		
	LOWER	MIDDLE	UPPER
CU-1772/SRA-56	2.0 mc	4.0 mc	6.0 mc
CU-1774/SRA-57	4.0 mc	8.0 mc	12.0 mc
CU-1776/SRA-58	10.0 mc	20.0 mc	30.0 mc

SECTION 3

OPERATION

3.1 SCOPE

This section contains a description of the functional operation, controls and indicators, normal and emergency operating procedures, and operator's maintenance for Antenna Coupler Groups AN/SRA-56, -57, and -58.

Unless otherwise specified, the descriptions and procedures contained in this section apply to all antenna couplers in all three coupler groups for both four and eight channel configurations. Where descriptions or procedures differ because of the inherent characteristics in the coupler group or configuration, these differences are identified through the use of formal AN nomenclature of the coupler groups or reference to the configuration of the equipment.

3.2 FUNCTIONAL OPERATION

Antenna Coupler Groups AN/SRA-56, -57 and -58 are identical in functional operation except for the frequency range over which each operates. Antenna Coupler Group AN/SRA-56 operates in the nominal frequency range from 2 to 6 mc; Antenna Coupler Group AN/SRA-57, in the frequency range from 4 to 12 mc; and Antenna Coupler Group AN/SRA-58, in the frequency range from 10 to 30 mc.

Each coupler group provides four separate channels to permit up to four transmitters to be connected simultaneously to an associated, common antenna. However, two Antenna Coupler Groups AN/SRA-56, or two Antenna Coupler Groups AN/SRA-57, can be combined to provide an eight-channel configuration, thus permitting up to eight transmitters to share the same antenna. Antenna Coupler Group AN/SRA-58 can be used only in a four-channel configuration.

Each antenna coupler group is physically self-contained in a separate electrical equipment cabinet containing four antenna coupler (channel) drawer assemblies and a common power supply panel.

To form an eight-channel configuration, two equipment cabinets (AN/SRA-56 or AN/SRA-57) are bolted together and the rf outputs are combined with an impedance matching network mounted on the rear of the cabinets.

Functionally, the antenna couplers within each antenna coupler group provide the means to couple the individual transmitters, each having power outputs as high as 1 kilowatt average or 2 kilowatts peak envelope power, to a single broadband antenna. Each antenna coupler permits the transfer, filtering, and matching of rf power from its associated transmitter to the antenna while preventing interference caused by the flow of significant rf power into that transmitter from other transmitters operating through the same coupler group.

Any antenna coupler may be operated at any frequency within the frequency range covered by the antenna coupler group, provided that the frequency is separated more than 5 percent from the operating frequency of any other antenna coupler within the same coupler group.

Each antenna coupler contains monitoring, control, and protective circuits that provide and enforce sequential tuning and operation. The power supply panel in each coupler group contains a fused circuit that provides ac to operate the cooling air fans in each antenna coupler to remove the heat generated during tuning and operation, a power supply that provides dc to operate the control and protective circuits, and a sonic generator that provides an audible alarm to warn the operator of a loss of air flow within an antenna coupler.

In operation, rf power from each transmitter is fed to the coupler group through individual 50-ohm coaxial transmission lines. The individual rf signals enter the coupler group through separate operate reflectometers (which continuously monitor the forward and reflected rf power components of the signal) and are delivered to the rf relay assembly. Depending upon the state of the rf relays in the rf relay assembly, each individual signal is fed directly to its associated antenna coupler (during operation) or to the power attenuator and tune reflectometer (during tuning). The power attenuator and tune reflectometer are shared by all four antenna couplers within the coupler group, and only one transmitter at a time is permitted access to these components. The power attenuator acts as a dummy load for the transmitter during tuning and reduces the power level so that only a small portion of the transmitter rf is applied to the antenna during the tuning procedures. The tune reflectometer is more sensitive than the operate reflectometer and is used to adjust the output coupling when loading the antenna coupler.

Each antenna coupler is interlocked with its associated transmitter to prevent the rf power from being applied to the channel unless the antenna coupler is functioning properly. The control circuitry within the antenna couplers also prevents more than one antenna coupler at a time from being tuned since all antenna couplers share the same power attenuator and tune reflectometer.

From the rf relay assembly, the rf signal enters the associated antenna coupler, which consists of an input matching network and input link assembly and a two-resonator bandpass filter. During tuning, the resonators of the bandpass filter are each tuned to resonance and the coupling between output resonator and output link is adjusted to load the antenna coupler. When the tuning procedures have been accomplished in the prescribed manner, a highly selective bandpass circuit is created and the input impedance of the antenna coupler matches the impedance of the rf line from the transmitter. This permits the antenna coupler to transfer efficiently the rf signal from the associated transmitter to the antenna while minimizing the interference between transmitters.

An output coupling link in the equipment cabinet delivers the rf signal from the output resonator to the combining network of the four-channel combiner. The combiner establishes the proper impedances to permit the four antenna coupler (channel) outputs to be combined and delivered to the antenna.

The tuning of each antenna coupler is controlled by the TUNE/OPERATE switch and three variable controls (FREQ ADJUST INPUT, FREQ ADJUST OUTPUT, and OUTPUT COUPLING) on the front panel. The TUNE/OPERATE switch controls the sequence of tuning and operation of the antenna coupler. The FREQ ADJUST INPUT control adjusts the input resonator variable capacitor to tune the input resonator. The FREQ ADJUST OUTPUT control adjusts the output resonator variable capacitor to tune the output resonator. The OUTPUT COUPLING control adjusts the coupling between the output resonator and the output link to load the antenna coupler.

For the tuning and operation of the antenna coupler, the forward component of the transmitter power is continuously monitored and displayed on the RF POWER FORWARD meter on the front panel; the relative input resonator voltage and the reflected component of the transmitter power are monitored and displayed on the RF POWER REFLECTED meter. The reflected power and the output resonator voltage are continuously monitored by the control circuitry which shuts down the transmitter and antenna coupler if either the reflected power or output resonator voltage become excessive. The NORMAL indicator on the front panel lights to indicate that the antenna coupler is being tuned and operated in the proper manner. If the tuning procedures are not followed correctly, or a malfunction occurs within the channel or NTDS issues a TUNE ACTIVATE command, or loss of SELECT OPERATE occurs, the NORMAL indicator will go out and the RETUNE indicator will light. When a retune condition exists, the control circuits shut down the antenna coupler and associated transmitter. The operator must take corrective action and retune the antenna coupler in the prescribed manner.

Heat generated in the antenna coupler group is removed by cooling fans located in each antenna coupler drawer. These fans provide forced air across the input and output resonators, output link, combiner, and power attenuator. The cooling air flow is monitored by an air flow sensor in each antenna coupler drawer. When the cooling air becomes inadequate, the AIR FLOW and RETUNE indicators on the front panel light, the audible ALARM on the power supply panel sounds, and the loss-of-air-flow control circuits shut down the antenna coupler and associated transmitter. The audible ALARM can be turned off by pressing the ALARM SILENCER switch on the power supply panel, but the AIR FLOW and RETUNE indicators on the particular antenna coupler will remain lit until proper air flow is restored.

In an emergency, the protective circuits (excessive vswr, overvoltage, loss of air flow, NTDS inhibit) can be bypassed by operating the EMERGENCY-ON/OFF switch on the front panel of the antenna coupler. This prevents the above conditions from causing a RETUNE indication and permits the antenna coupler to continue to operate in an emergency mode.

3.3 OPERATING PROCEDURES

The operating procedures for Antenna Coupler Groups AN/SRA-56, -57 and -58 are identical and are based on the tuning and operation of a single antenna coupler within the group. All antenna couplers are tuned and operated in the same sequence and manner. The differences between antenna coupler groups, or between antenna couplers,because of the frequency ranges over which they operate do not affect the operating procedures in any manner.

These procedures also apply to eight-channel configurations of the equipment. Each antenna coupler group can be treated individually except that the restriction on frequency separation must be observed. Do not attempt to tune any antenna coupler within 5 percent of the operating frequency to which any of the remaining seven channels are tuned.

WARNING

Stay well away from the output link assemblies at all times. This equipment is designed to permit maintenance during operation and, if an antenna coupler drawer is removed from the cabinet for maintenance, the output link is accessible. When a transmitter is operating through ANY antenna coupler in the group, ALL output link assemblies contain extremely high rf voltages that may be fatal if personal contact is made.

3.3.1 Controls and Indicators

The controls and indicators required for operation are contained on the power supply panel and on the front panel of the individual antenna couplers. The controls and indicators on the power supply panel are illustrated in figure 3-1 and described in table 3-1. The controls and indicators on the front panel of the antenna coupler are illustrated in figure 3-2 and described in table 3-2. The controls and indicators are identical for all power supply panels used in all the three groups. The controls and indicators for all antenna couplers in all three groups are also identical, except for the frequency indicating dials which are calibrated for the frequency range of the associated antenna coupler group.

3.3.2 Sequence of Operation

The sequence of operation presented in the following paragraphs defines the steps required to tune, operate, and secure any antenna coupler (channel) within Antenna Coupler Groups

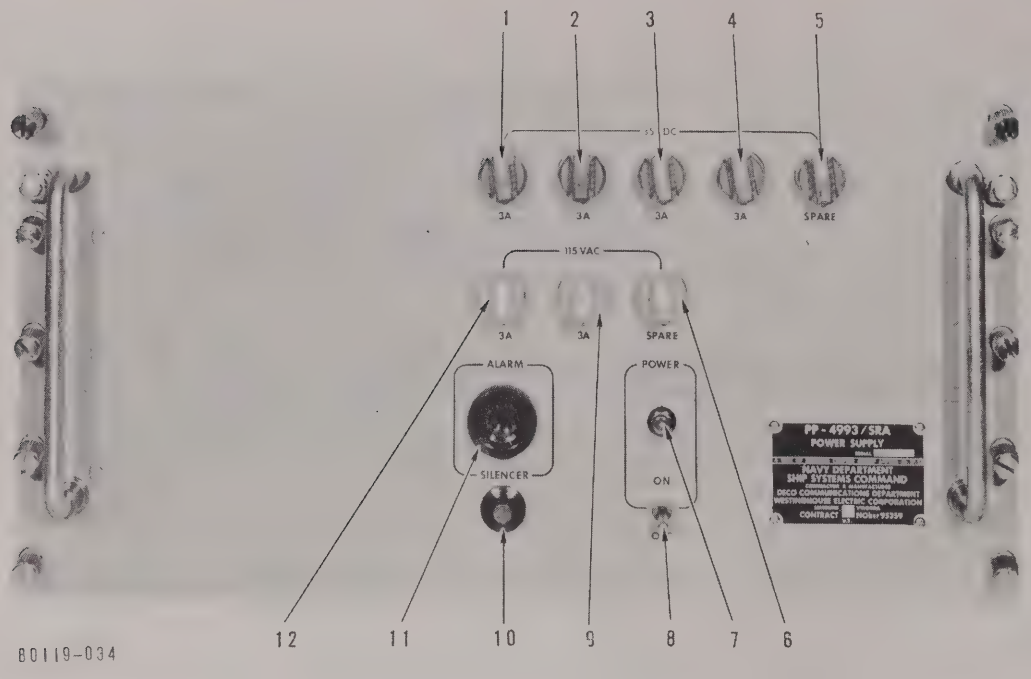


Figure 3-1 Power Supply Panel, Controls and Indicators

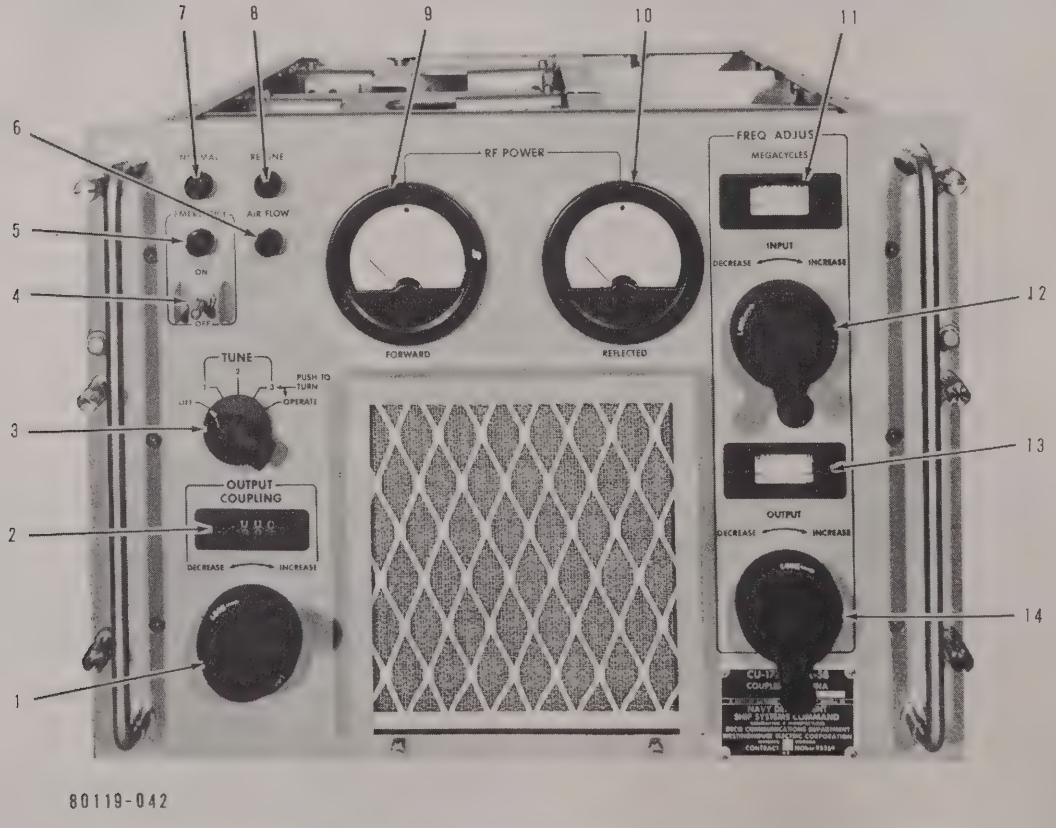


Figure 3-2 Antenna Coupler, Controls and Indicators

TABLE 3-1 POWER SUPPLY PANEL CONTROLS AND INDICATORS

INDEX	CONTROL OR INDICATOR	FUNCTION
1	35VDC-3A fuse and indicator	Three-ampere fuse that protects the +35 volt dc supply to antenna coupler 1A1 from overloads, and indicator that lights (amber) when fuse blows.
2	35VDC-3A fuse and indicator	Three-ampere fuse that protects the +35 volt dc supply to antenna coupler 1A2 from overloads, and indicator that lights (amber) when fuse blows.
3	35VDC-3A fuse and indicator	Three-ampere fuse that protects the +35 volt dc supply to antenna coupler 1A3 from overloads,and indicator that lights (amber) when fuse blows.
4	35VDC-3A fuse and indicator	Three-ampere fuse that protects the +35 volt dc supply to antenna coupler 1A4 from overloads, and indicator that lights (amber) when fuse blows.
5	35VDC-SPARE fuse and indicator	Three-ampere fuse with indicator assembly for use as a spare to items 1 through 4 as required.
6	115VAC-SPARE fuse and indicator	Three-ampere fuse with indicator assembly for use as a spare to items 9 and 12 as required.
7	POWER lamp	Amber neon lamp that lights to indicate that primary power (115vac) is applied to the power supply panel 1A5 when the POWER-ON/OFF switch is in the ON position.
8	POWER-ON/OFF switch	Two-position toggle switch that controls the application of primary power (115vac) to the power supply panel 1A5.
9	115VAC-3A fuse and indicator	Three-ampere fuse that protects one side of the primary power (115vac) input circuit to the power supply panel 1A5 from overloads, and indicator that lights (white) when fuse blows.
10	ALARM SILENCER switch	Pushbutton switch that deactivates the audible ALARM when switch is depressed.
11	ALARM sonic generator	Audible alarm that provides a 2800 cps tone if the air flow in any antenna coupler in the group becomes inadequate.
12	115VAC-3A fuse and indicator	Three-ampere fuse that protects other side of the primary power (115 vac) input circuit to the power supply panel 1A5 from overloads, and indicator that lights (white) when fuse blows.

TABLE 3-2 ANTENNA COUPLER CONTROLS AND INDICATORS

INDEX	CONTROL OR INDICATOR	FUNCTION
1	OUTPUT COUPLING control	Rotary control that adjusts the inductive coupling between the output resonator and output link. DECREASE/INCREASE panel markings indicate the direction that the OUTPUT COUPLING control must be rotated to decrease or increase the output coupling. LOCK/UNLOCK dial permits the control to be secured in any desired position.
2	OUTPUT COUPLING dial	Three-digit rotary counter that indicates the relative position of the output link with respect to the output resonator, and therefore, the relative degree of coupling.
3	OFF/TUNE-1, -2, -3/ OPERATE switch (Control name: TUNE/ OPERATE switch)	Five-position rotary switch that controls the sequence of tuning and operation, the selection of control and monitoring devices, and the application of protective elements as required to tune and operate the antenna coupler.
	"OFF" switch position	Deactivates control and monitoring circuits and opens the transmitter interlock circuit to prevent rf from being applied to the antenna coupler.
	"TUNE-1" switch position	Establishes the conditions for tuning the input resonator by closing the transmitter interlock circuit, energizing the associated rf relay to switch the transmitter rf into the power attenuator, connecting the operate reflectometer to the RF POWER FORWARD meter for monitoring the forward transmitter power, and connecting the input resonator voltage sensor to the RF POWER REFLECTED meter for monitoring the maximum input resonator voltage during tuning.
	"TUNE-2" switch position	Establishes the conditions for tuning the output resonator by maintaining the same conditions as in TUNE-1 position and removing short from output resonator. RF POWER REFLECTED meter monitors minimum input resonator voltage during tuning.
	"TUNE-3" switch position	Establishes the conditions for adjusting the output coupling by maintaining the same conditions as in TUNE-2 position, but connecting the tune reflectometer to the RF POWER REFLECTED meter for monitoring of low-level reflected rf power during adjustment of output coupling and final tuning.

TABLE 3-2 ANTENNA COUPLER CONTROLS AND INDICATORS (Continued)

INDEX	CONTROL OR INDICATOR	FUNCTION
3 (Cont'd.)	OPERATE switch position	Establishes the conditions for operation of the antenna coupler by deenergizing the rf relay to switch the transmitter rf directly into the antenna coupler, and connecting the operate reflectometer to the RF POWER REFLECTED meter for monitoring of high-level reflected rf power during operation.
4	EMERGENCY-ON/OFF switch	Two-position toggle switch that bypasses protective circuits activated during a cooling system failure, overvoltage, or excessive vswr to permit the antenna coupler to operate in an emergency mode.
5	EMERGENCY lamp	Red lamp that lights to indicate that protective circuits are bypassed when EMERGENCY-ON/OFF switch is in the ON position.
6	AIRFLOW lamp	Red lamp that lights when the cooling air flow within the antenna coupler is inadequate.
7	NORMAL lamp	Green lamp that lights to indicate that the antenna coupler is being tuned or operated satisfactorily.
8	RETUNE lamp	Red lamp that lights when the antenna coupler must be retuned because of improper tuning procedures, equipment drift, malfunction in the rf circuit, or inadequate air flow within the antenna coupler.
9	RF POWER FORWARD meter	Microammeter with scale from 0 to 1.5 kw that indicates the forward power component of the transmitter rf signal applied to the antenna coupler during tuning and operation.
10	RF POWER REFLECTED meter	Microammeter with scale from 0 to 250 watts that indicates the relative voltage of the input resonator when the TUNE/OPERATE switch is in TUNE-1 and TUNE-2 positions, the relative, low level reflected power component of the rf signal when the TUNE/OPERATE switch is in the TUNE-3 position, and the high-level reflected power component of the rf signal when the TUNE/OPERATE switch is in the OPERATE position.
11	FREQ ADJUST INPUT dial	Horizontally moving, flexible steel, tape dial calibrated from 1.9 to 6.4 mc (AN/SRA-56), 3.9 to 13.0 mc (AN/SRA-57) or 9.5 to 32.0 mc (AN/SRA-58) that indicates the frequency to which the input resonator is tuned.
12	FREQ ADJUST INPUT control	Rotary control that adjusts the resonant frequency of the input resonator. DECREASE/INCREASE panel markings indicate the direction that the FREQ ADJUST INPUT control must be rotated to decrease or increase the resonant frequency. LOCK/UNLOCK dial permits the control to be secured at any desired frequency.

TABLE 3-2 ANTENNA COUPLER CONTROLS AND INDICATORS (Continued)

INDEX	CONTROL OR INDICATOR	FUNCTION
13	FREQ ADJUST OUTPUT dial	Horizontally moving, flexible steel, tape dial calibrated from 1.9 to 6.4 mc (AN/SRA-56), 3.9 to 13.0 mc (AN/SRA-57) or 9,5 to 32.0 mc (AN/SRA-58) that indicates the frequency to which the output resonator is tuned.
14	FREQ ADJUST OUTPUT control	Rotary control that adjusts the resonant frequency of the output resonator, DECREASE/INCREASE panel markings indicate the direction that the FREQ ADJUST OUTPUT control must be rotated to decrease or increase the resonant frequency. LOCK/UNLOCK dial permits the control to be secured at any desired frequency.

AN/SRA-56, -57, or -58. These procedures are identical for the antenna couplers in all three antenna coupler groups.

Any antenna coupler can be tuned to any frequency within the frequency range of its associated antenna coupler group without regard to the sequence of operating frequencies. Any antenna coupler can be tuned or operated at any power level (within its power rating) without regard to sequence or combination of power levels presented by other antenna couplers in the same antenna coupler group. However, at least 50 watts is required for each antenna coupler for optimum tuning.

CAUTION

If the required indication at any step in the procedures cannot be attained, rotate the TUNE/OPERATE switch to OFF and the OUTPUT COUPLING control in the maximum DECREASE direction to the stop, and notify maintenance personnel. Ensure that any trouble in the equipment has been corrected before continuing with the procedures.

3.3.2.1 Preliminary Checks, Adjustments, and Control Settings

Make the following checks, adjustments, and settings before attempting to tune or operate an antenna coupler:

Step 1. Check the other three antenna couplers in the group and ensure that the TUNE/OPERATE switch on each antenna coupler is set either to the OFF or to the OPERATE position.

Step 2. Ensure that the rf output of the associated antenna coupler group (or impedance matching network of an eight-channel configuration) is correctly patched or connected to the proper antenna (or terminated into the ship's dummy antenna).

Step 3. Ensure that the transmitter operating frequency is separated at least 5 percent from the operating frequencies of all other antenna couplers in the coupler group or eight-channel configuration.

CAUTION

Always preset the FREQ ADJUST INPUT and FREQ ADJUST OUTPUT controls before attempting to tune the antenna coupler. Do not adjust these controls across the operating frequency of another antenna coupler unless the TUNE/OPERATE switch on the antenna coupler being tuned is in the OFF position and the OUTPUT COUPLING control is in the maximum DECREASE position. RF from other antenna couplers may be coupled into the antenna coupler being tuned and damage the equipment.

Step 4. Ensure that EMERGENCY-ON/OFF switch is in the OFF position.

Step 5. On the coupler group power supply panel, operate the POWER-ON/OFF switch to ON; POWER indicator should light and cooling fans in all antenna couplers in the group should operate.

Note

POWER-ON/OFF switch should already be ON if another antenna coupler is operating through the coupler group.

Step 6. Check the Coupler Adapter (if installed) associated with this antenna coupler. Switch Coupler Adapter LOCAL-REMOTE switch to REMOTE. Switch LOAD SELECTOR to COUPLER. Switch ALARM ON-OFF switch to ON. Switch OPR-STBY-TUNE switch to STBY.

3.3.2.2 Tuning Procedures

After the preliminary checks, adjustments, and settings have been accomplished, the antenna coupler is tuned in accordance with the procedures given below. Tune only one antenna coupler at a time. Follow these procedures carefully and in the exact sequence given. Any attempt to deviate from this sequence will activate the control and protective circuits within the antenna coupler and require the entire tuning procedure to be repeated from the beginning. This can only result in wasted time and effort.

CAUTION

Rotate TUNE/OPERATE switch to OFF and OUTPUT COUPLING control in the maximum DECREASE direction to the stop if the RETUNE indicator lights during any step in the procedures. Before retuning the antenna coupler, ensure (1) that the AIR FLOW indicator is not lit and (2) that the operating frequency is greater than 5 percent from other antenna couplers in the group or configuration. Rotate TUNE/OPERATE switch to TUNE 1 and repeat the procedures from the beginning. If the RETUNE indicator lights again during the repeat procedures, secure the antenna

coupler in accordance with paragraph 3.3.2.5 and notify maintenance personnel. (See paragraph 3.4 for emergency operation.)

Step 1. If a coupler adapter is used, check to be sure adapter is in REMOTE mode.

Step 2. Tune transmitter in normal manner. Unkey transmitter. Check the Transmitter Adapter or multicoupler control (if installed) associated with this transmitter. Switch MODE SELECTOR to PA TUNE and then to COUPLER TUNE-OPERATE.

Step 3. On antenna coupler being tuned, rotate TUNE/OPERATE switch to OFF.

Step 4. Rotate OUTPUT COUPLING control in the DECREASE direction to the stop; OUTPUT COUPLING dial should read approximately 000.

Step 5. Rotate FREQUENCY ADJUST INPUT control until the FREQUENCY ADJUST INPUT dial indicates the same frequency as the transmitter.

Step 6. Rotate the FREQUENCY ADJUST OUTPUT control until the FREQUENCY ADJUST OUTPUT dial indicates the same frequency as the transmitter.

Step 7. Check the other three antenna couplers in the group and ensure that the TUNE/OPERATE switch on each coupler is set either to the OFF or OPERATE position.

Step 8. On the coupler being tuned, rotate the TUNE/OPERATE switch to the TUNE 1 position. Coupler NORMAL lamp should light, transmitter TUNE lamp should light, transmitter should be automatically keyed in tune power, and indications should be obtained on coupler FORWARD and REFLECTED power meters.

Step 9. Carefully rotate the FREQ ADJUST INPUT control as required to obtain a maximum (peak) indication on the RF POWER REFLECTED meter. When this indication is attained, lock the control. No further adjustment of this control is required.

Step 10. Rotate TUNE/OPERATE switch to TUNE-2; NORMAL indicator must remain lit.

Step 11. Carefully rotate the FREQ ADJUST OUTPUT control as required to obtain a minimum (null) indication on the RF POWER REFLECTED meter.

Step 12. Rotate TUNE/OPERATE switch to TUNE-3; NORMAL indicator must remain lit, and RF POWER REFLECTED meter should deflect upscale.

Step 13. Carefully rotate the OUTPUT COUPLING control in the INCREASE direction to obtain again a minimum (null) indication on the RF POWER REFLECTED meter.

Step 14. Carefully rotate FREQ ADJUST OUTPUT control as required to obtain a new minimum (null) indication on RF POWER REFLECTED meter that is less than that obtained in Step 13.

Step 15. Repeat Steps 13. and 14. as required until RF POWER REFLECTED meter indicates a minimum as near zero as possible. When this indication is attained, proceed with Step 16.

Step 16. Depress TUNE/OPERATE switch, rotate to OPERATE, and release. Transmitter will automatically unkey in TUNE power and after approximately 1.5 seconds will be placed in OPERATE. Coupler NORMAL lamp must remain lit; transmitter OPERATE lamp should light. RF POWER FORWARD meter will indicate transmitter average output power when the transmitter is energized. Coupler is now tuned and ready for operation.

Step 17. After transmitter is placed in normal operation, RF POWER REFLECTED meter on coupler may deflect upscale. If deflection is in excess of a few watts, very carefully rotate FREQ ADJUST OUTPUT and OUTPUT COUPLING controls as in Steps 13. and 14. until RF POWER REFLECTED meter indicates a minimum as near zero as possible. When this indication is obtained, lock both controls. Do not adjust FREQ ADJUST INPUT.

3.3.2.3 Normal Operating Procedures

Once an antenna coupler has been tuned and is operational, it may be left unattended. However, to ensure optimum performance and early detection of faults, it is desirable to periodically monitor the RF POWER REFLECTED meter and the NORMAL indicator on the antenna coupler front panel.

As long as the NORMAL indicator remains lit and RF POWER REFLECTED meter indication is less than 1% of the RF POWER FORWARD meter indication, no further action is required.

During operation, the NORMAL indication may be replaced by a RETUNE indication due to: Breaking or changing the RF matrix patch, change in transmitter frequency, coupler fault. The RF POWER REFLECTED indication may change due to antenna impedance variations or thermal drift in the coupler.

Follow the procedures below to monitor and adjust the coupler during operation:

Step 1. Periodically check the NORMAL, EMERGENCY, RETUNE, and AIRFLOW indicators on the front panel of the coupler. If the NORMAL indicator alone is lit, proceed to Step 9.

Step 2. If NORMAL and EMERGENCY indicators only are lit, ensure that the antenna coupler is not required to operate in the emergency mode (paragraph 3.4) and operate EMERGENCY-ON/OFF switch to OFF.

Step 3. If NORMAL, AIRFLOW, and EMERGENCY indicators are lit, coupler is being purposely operated with cooling fan or air flow problems (paragraph 3.4). Limit operation to shortest time necessary to minimize possible coupler damage.

Step 4. If RETUNE and AIRFLOW indicators are lit, audible alarm should sound. Antenna coupler has automatically shut down because of loss of cooling air. Momentarily depress ALARM SILENCER on power supply panel. Secure coupler by rotating TUNE-OPERATE switch to OFF and OUTPUT COUPLING control in the DECREASE direction to the stop. Notify circuit control. Notify repair technician.

Step 5. If RETUNE indicator alone is lit, coupler has automatically shut down for one of several reasons. Rotate TUNE-OPERATE switch to the OFF position and OUTPUT COUPLING control in the DECREASE direction to the stop. Now rotate the TUNE-OPERATE switch to TUNE 1 position. NORMAL indicator should light.

Step 6. After completion of Step 5, if RF POWER FORWARD meter shows presence of RF power, proceed to Step 7. If no RF POWER FORWARD indication is noted, RF matrix crosspoint has been broken or changed. Secure the coupler by rotating TUNE-OPERATE switch to OFF. Notify circuit control that coupler has been secured. No further action is required.

Step 7. After completion of Step 5, if RF POWER FORWARD meter shows presence of RF power, unlock FREQ ADJUST INPUT control. Rotate FREQ ADJUST INPUT through one-half turn each side of its original locked position while observing the RF POWER REFLECTED meter indication for a maximum (peak). If no peak is observed, proceed to Step 8. If a peak is observed, coupler had been automatically shut down due to a coupler fault. Follow normal tuning procedure (paragraph 3.3.2.2) from Step 9. After tuning is complete, notify circuit control.

Step 8. If in Step 7, RF POWER REFLECTED does not peak, then transmitter frequency has been changed and coupler has automatically shut down. Secure the coupler by rotating TUNE-OPERATE switch to OFF. Inform circuit control and request instructions.

Step 9. With TUNE-OPERATE switch in the OPERATE position, if RF POWER REFLECTED meter indication is zero or less than 1% of RF POWER FORWARD meter indication, no further action is required. If RF POWER REFLECTED indication is excessive, proceed with Step 10.

Note

During the first 5 minutes of continuous operation, thermal drift may cause RF POWER REFLECTED to increase. Check RF POWER REFLECTED meter frequently during this interval, performing adjustments in Steps 10 through 12 as required. After 15 minutes of continuous operation, the coupler will stabilize and periodic monitoring only will be required.

Step 10. Unlock and very carefully rotate OUTPUT COUPLING control as required to obtain a minimum (dip) indication on the RF POWER REFLECTED meter.

Step 11. Unlock and very carefully rotate FREQ ADJUST OUTPUT control as required to further reduce the indication on the RF POWER REFLECTED meter.

Step 12. Repeat Steps 10 and 11 as required until indication on RF POWER REFLECTED meter is as low as possible. Lock both controls.

Note

If RETUNE indicator lights during the adjustment procedure or an acceptable RF POWER REFLECTED meter indication cannot be attained, rotate TUNE-OPERATE switch to OFF and OUTPUT COUPLING control in the maximum DECREASE direction to the stop, and repeat the entire tuning procedure from the beginning. Observe all warnings and cautions.

3.3.2.4 Standby Operation

No special procedures are required to place the antenna coupler in standby operation. When the associated transmitter is placed in standby, the antenna coupler is automatically in standby. Leave the TUNE/OPERATE switch in OPERATE and do not adjust any of the controls. When the transmitter rf is reapplied, the antenna coupler will return to service instantly.

Note

If the transmitter has been in standby for an extended time, the antenna coupler may require a 5 minute warm up period before the indication on the RF POWER REFLECTED meter returns to its operational point. Do not adjust any of the controls during this period unless the RF POWER REFLECTED meter indication exceeds 50 watts. After 15 minutes, periodically monitor indicators and adjust controls as under normal operating procedures (paragraph 3.3.2.3).

3.3.2.5 Securing Procedures

When the associated transmitter or the antenna coupler must be taken out of service, the antenna coupler is secured in the following manner:

Step 1. Deenergize the transmitter to remove rf power from the antenna coupler.

Step 2. Rotate TUNE/OPERATE switch to OFF.

Step 3. Rotate OUTPUT COUPLING control in the maximum DECREASE direction to the stop.

Step 4. If all four antenna couplers in the antenna coupler group have been secured, operate POWER-ON/OFF switch on the power supply panel to OFF.

Note

In an emergency situation, any antenna coupler can be shut down immediately by rotating the TUNE/OPERATE switch to OFF. All four antenna couplers in the group can be shut down simultaneously by operating the POWER-ON/OFF switch on the power supply panel to OFF. Any associated transmitter will automatically shut down when the interlock line is opened. Continue to secure each antenna coupler by rotating the TUNE/OPERATE switch to OFF and the OUTPUT COUPLING control in the DECREASE direction to the stop.

3.4 SUMMARY OF OPERATING PROCEDURES

A summary of the operating procedures for Antenna Coupler Groups AN/SRA-56, -57, and -58 is presented in table 3-3.

TABLE 3-3 SUMMARY OF OPERATING PROCEDURES

STEP	PROCEDURE	INDICATIONS OR PRECAUTIONS
GENERAL INSTRUCTIONS		
1	Read your instruction manual carefully.	WARNING Do not permit personnel or equipment to come in contact with any output link while any transmitter is operating through the coupler group. These links contain extremely high rf voltages that may be fatal if contacted.
2	Ensure that rf circuits are patched or connected to the associated antenna coupler and that output of antenna coupler group is patched or connected to the associated antenna.	
3	Do not attempt to tune or operate an antenna coupler within 5 percent of the frequency at which another antenna coupler within the group is already operating.	

TABLE 3-3 SUMMARY OF OPERATING PROCEDURES (Continued)

STEP	PROCEDURE	INDICATIONS OR PRECAUTIONS
GENERAL INSTRUCTIONS (Continued)		
4	Tune only one antenna coupler at a time	
5	Follow the tuning procedures in the exact sequence given.	
PRELIMINARY SETTINGS		
1	On the coupler adapter, if installed, switch LOCAL-REMOTE to REMOTE, LOAD SELECTOR to COUPLER, ALARM ON/OFF to ON, OPR-STBY-TUNE to STBY	
2	Check that the TUNE-OPERATE switch on all other couplers in the same cabinet is in the OFF or OPERATE position.	
TUNING PROCEDURES		
1	Check that coupler adapter, if installed is in REMOTE mode.	
2	Tune transmitter, if required.	
3	On transmitter adapter or multicoupler adapter if installed, switch MODE SELECTOR to PA TUNE and then to COUPLER TUNE.	STANDBY indicators should extinguish
4	On coupler being tuned, rotate TUNE-OPERATE switch to OFF and rotate OUTPUT COUPLING in the DECREASE direction to the stop.	OUTPUT COUPLING dial should should indicate approx. 000
5	Rotate FREQ ADJUST INPUT and FREQ ADJUST OUTPUT controls until control dials indicate operating frequency.	CAUTION Always preset tuning controls to operating frequency before tuning coupler.

TABLE 3-3 SUMMARY OF OPERATING PROCEDURES (Continued)

STEP	PROCEDURE	INDICATIONS OR PRECAUTION
TUNING PROCEDURES (Continued)		
6	On antenna coupler, rotate TUNE/OPERATE switch to TUNE 1. CAUTION If RETUNE indicator lights during tuning procedures, rotate TUNE/OPERATE switch to OFF. Repeat entire procedure from Step 4. If second tuning attempt results in RETUNE indication, secure coupler, notify circuit control and repair technician.	NORMAL indicator must light. RF POWER FORWARD should indicate 50 - 200 watts. CAUTION RF POWER FORWARD greater than 200 watts during tuning will damage coupler.
7	Carefully rotate FREQ ADJUST INPUT control to peak RF POWER REFLECTED indication. Lock control.	RF POWER REFLECTED meter to indicate a maximum (peak).
8	Rotate TUNE/OPERATE switch to TUNE 2.	NORMAL indicator must remain lighted.
9	Carefully rotate FREQ ADJUST OUTPUT control to null RF POWER REFLECTED indication.	RF POWER REFLECTED meter to indicate a minimum (null).
10	Rotate TUNE/OPERATE switch to TUNE 3.	NORMAL indicator must remain lit and RF POWER REFLECTED may deflect upscale.
11	Rotate OUTPUT COUPLING control to null RF POWER REFLECTED indication.	RF POWER REFLECTED meter to indicate a minimum (null).
12	Carefully rotate FREQ ADJUST OUTPUT control for deeper null in RF POWER REFLECTED indication.	RF POWER REFLECTED meter to indicate a minimum (null), less than Step 11.
13	Repeat Steps 11 and 12 for deepest possible null in RF POWER REFLECTED indication.	RF POWER REFLECTED meter to indicate a minimum (null) as near zero as possible.
14	Depress and rotate TUNE/OPERATE switch to OPERATE. Release switch.	Normal lamp must remain lit. Transmitter will automatically unkey tune power and after 1.5 seconds will go to OPERATE condition.

TABLE 3-3 SUMMARY OF OPERATING PROCEDURES (Continued)

STEP	PROCEDURE	INDICATIONS OR PRECAUTIONS
TUNING PROCEDURES (Continued)		
15	When transmitter is keyed, RF POWER REFLECTED METER may deflect upscale. If indication is more than 1% of RF POWER FORWARD indication, very carefully rotate FREQ ADJUST OUTPUT and OUTPUT COUPLING as in Steps 11 and 12 for deepest possible null in RF POWER REFLECTED indication.	NORMAL lamp must remain lit. RF POWER REFLECTED meter to indicate a minimum (null) as near zero as possible. Do not adjust FREQ ADJUST INPUT.
16	Lock FREQ ADJUST OUTPUT and OUTPUT COUPLING controls.	
NORMAL OPERATING PROCEDURES		
1	On the coupler, periodically monitor NORMAL and RETUNE indicators. If the NORMAL indicator alone is lit, proceed to Step 7.	Either NORMAL or RETUNE indicators may be lit. If EMERGENCY or AIRFLOW indicators are lit, see detailed operating procedures (Para. 3.3.2.3).
2	If RETUNE indicator alone is lit, coupler has automatically shut down. Rotate TUNE/OPERATE to OFF and OUTPUT COUPLING in DECREASE direction to stop.	A RETUNE indication may result from normal operation or a coupler fault. Follow procedure to determine cause.
3	Rotate TUNE/OPERATE switch to TUNE 1. If RF POWER FORWARD meter shows RF power, proceed to Step 5.	NORMAL indicator must light.
4	If RF POWER FORWARD meter shows no RF in Step 3, matrix crosspoint has been broken or changed. Secure by rotating TUNE/OPERATE to OFF. Notify Circuit Control. No further action is required.	This condition is a result of normal operation. Do not retune coupler unless directed to do so by Circuit Control. All coupler lamps will extinguish.
5	If RF POWER FORWARD meter shows rf power in Step 3, unlock and rotate FREQ ADJUST INPUT approx. 1/2 turn each side of locked position. While observing RF POWER REFLECTED for a peak. If no peak, proceed to Step 6. If RF POWER REFLECTED peaks, follow normal tuning procedure to retune coupler. Notify Circuit Control.	If RF POWER REFLECTED peaks, RETUNE was caused by a coupler fault. If RETUNE indication occurs again, secure coupler, notify Circiut Control and repair tech.

TABLE 3-3. SUMMARY OF OPERATING PROCEDURES (Continued)

STEP	PROCEDURE	INDICATIONS OR PRECAUTIONS
	NORMAL OPERATING PROCEDURES (Continued)	
6	If RF POWER REFLECTED does not peak in Step 5, transmitter frequency has been changed. Secure coupler by rotating TUNE/OPERATE to OFF. Request instructions from Circuit Control.	
7	With NORMAL indicator alone lit, if RF POWER REFLECTED is zero or less than 1% of RF POWER FORWARD, no further action is necessary.	
8	If RF POWER REFLECTED is excessive, carefully adjust FREQ ADJUST OUTPUT and OUTPUT COUPLING for minimum RF POWER REFLECTED. Lock controls.	If RETUNE indication occurs, follow normal tuning procedure to retune. Notify Circuit Control. Do not adjust FREQ ADJUST INPUT.
	SHUTDOWN AND SECURING PROCEDURES	
1	Deenergize the associated transmitter.	RF POWER FORWARD meter should indicate zero.
2	Rotate TUNE/OPERATE switch to OFF.	
3	Rotate OUTPUT COUPLING control in DECREASE direction to the stop.	
4	If all four antenna couplers in the group have been secured, operate POWER-ON/OFF switch on power supply panel to OFF.	

3.5 EMERGENCY OPERATION

Each antenna coupler is provided with an EMERGENCY-ON/OFF switch that permits the antenna coupler to operate under certain emergency conditions. During normal operation, the antenna coupler is protected by circuits that open the transmitter interlock to remove the rf power from the antenna coupler if the cooling air within the antenna coupler is inadequate (loss of air flow), excessively high rf voltage is present on the output resonator (overvoltage), or excessive rf power is reflected toward the transmitter (excessive vswr). When any of these three conditions occurs, the RETUNE indicator lights, and the antenna coupler must be retuned. If the fault condition is in the cooling system, the AIR FLOW indicator also lights and the audible ALARM on the power supply panel sounds.

When it is necessary in an emergency to operate the antenna coupler under any of these conditions, the protective circuits can be bypassed by operating the EMERGEYCY-ON/OFF switch to ON. The antenna coupler can then be retuned in the normal manner. However, reduced power should be used, if possible, and front panel meters carefully monitored for indications of abnormal operation. If arcing is detected, secure the antenna coupler or reduce operating power further.

To operate the antenna coupler in the emergency mode, proceed in the following manner.

CAUTION

When possible under the particular circumstances, limit the emergency operation of the antenna coupler to the shortest time necessary in order to minimize the damage that may result from operation in this mode for extended periods. During emergency operation, monitor the equipment frequently. As soon as possible, secure the antenna coupler, and repair before restoring to normal service.

Step 1. Rotate TUNE/OPERATE switch to OFF.

Step 2. Unlock and rotate OUTPUT COUPLING control in the maximum DECREASE direction to the stop.

Step 3. Rotate TUNE/OPERATE switch to TUNE-1. If the fault condition is in the air flow system and the audible ALARM sounds, depress ALARM SILENCER switch on power supply panel to silence the alarm. AIR FLOW indicator will remain lit.

Step 4. Operate EMERGENCY-ON/OFF switch to ON; EMERGENCY indicator must light, NORMAL indicator must light and RETUNE light must go out.

Step 5. Follow normal tuning and operating procedures given in paragraphs 3.3.2.2 and 3.3.2.3 except as noted below.

Note

If the emergency mode is required because of a fault in the air flow system, the AIR FLOW indicator will remain lit throughout the procedures.

Note

During the operation of the antenna coupler under emergency conditions, the indication on the RF POWER REFLECTED meter may not remain near zero. In this case, tune the antenna coupler for the minimum possible value. During operation in the emergency mode, frequently monitor all controls and indicators as in normal operation and, when required, adjust OUTPUT COUPLING and FREQ ADJUST OUTPUT controls to maintain a minimum value on the RF POWER REFLECTED meter.

Note

During operation of the antenna coupler under emergency condition with the AN/SRC-16 NTDS System, the NTDS Matrix may fail to select other AN/SRA-56, 57 or 58 couplers when so commanded. This condition indicates that the Matrix Crosspoint associated with the antenna coupler being operated in emergency mode has been broken. To restore normal matrix operation, secure that particular antenna coupler by rotating the FUNCTION switch to the OFF position and return the EMERGENCY/NORMAL switch to NORMAL position.

3.6 OPERATORS MAINTENANCE

To ensure proper operation of the antenna coupler groups, it is necessary to perform routine checks when coming on watch and during operation of the equipment so that minor defects that may occur can be readily corrected. Refer to the maintenance schedule in Section 5 for the routine checks required.

Become familiar with the technical details of the equipment in order to recognize the appearance of minor defects and to correct such defects when trained maintenance personnel are not available. Correction of these minor defects may prevent the occurrence of major failures at a later time.

3.6.1 Replacement of Indicator Lamps and Fuses

Occasionally it will be necessary to replace indicator lamps and fuses that may fail during the operation of the equipment. To replace indicator lamps in the antenna coupler front panel or power supply panel, simply unscrew the defective lamp and screw appropriate replacement lamp into the receptacle. To replace any of the fuses in the power supply panel, rotate the fuse holder one-half turn and remove from panel. Replace the fuse within the fuse holder, insert the fuse holder into the panel, and rotate one-half turn.

CAUTION

Do not replace fuse with one having a higher rating than the original. Notify maintenance personnel if the replacement fuse blows when power is restored to the circuit.

TABLE 4-1. TEST DATA FOR OPERATE REFLECTOMETER (Continued)

ITEM	CHARACTERISTICS	REMARKS
CRITICAL ADJUSTMENTS		
Forward Power Zero Set	A2C2	See paragraph 5.2.2.3.1
Reflected Power Zero Set	A1C2	See paragraph 5.2.2.3.1
Forward Power Calibration Adjustment	A2R1	See paragraph 5.2.2.3.1
Reflected Power Calibration Adjustment	A2R2	See paragraph 5.2.2.3.1
REFERENCE DATA		
Functional Block Diagram	Figure 4-21	
Servicing Block Diagram	Figure 4-23	
Simplified Schematic Diagram	Figure 4-1	
Detailed Schematic Diagram	Figure 5-50	
Parts Location	Figure 5-18	
Repair Procedures	Paragraph 5.3.1.4	
Alignment and Calibration Procedures	Paragraph 5.2.2.3.1	

4.3.2 RF Relay Assembly 1A6A7

Each coupler group cabinet contains one rf relay assembly used to reroute the rf signal path during tuning and operation. The rf relay assembly is identical in function and circuitry in all three coupler groups and is completely interchangeable between groups.

4.3.2.1 Functional Description

The rf relay assembly accepts the individual rf outputs from the operate reflectometers and transfers each output either directly to its associated antenna coupler during operation, or indirectly through the coupler group cabinet power attenuator and tune reflectometer into the

antenna coupler during tuning of that antenna coupler. Protective circuitry in each antenna coupler prevents more than one channel from being transferred simultaneously to the power attenuator and tune reflectometer. Thus, only one antenna coupler at a time can be tuned.

4.3.2.2 Circuit Description

A simplified schematic diagram of the rf relay assembly is shown in figure 4-2. When vacuum relays K1 through K8 are in the deenergized condition, the transmitter rf signals from each operate reflectometer are delivered straight through the rf relay assembly to their associated antenna coupler. However, when an antenna coupler is being tuned, +35 volts is applied to the corresponding relay pair in the rf relay assembly, and the rf signal path is switched through the power attenuator and tune reflectometer, back to the rf relay assembly, and then to the antenna coupler.

Control relay A1K1 on the antenna coupler circuit control board (1A1A1, 1A2A1, 1A3A1 or 1A4A1) is normally energized when the TUNE/OPERATE switch is in any position but OFF and is held in the energized condition by self-latching contacts. Relay A1K1 will deenergize if a malfunction in the equipment occurs, improper tuning procedures are attempted, an NTDS inhibit is produced by the NTDS interface adapter unit, or if the inhibit circuit senses that another antenna coupler is already in the tune mode (see paragraph 4.3.5.3.4.1).

Plus 35 volts is applied to TUNE/OPERATE switch deck A6S1-B1 through pin H of receptacle J1 on the antenna coupler. Switch deck A6S1-B1 and the closed contacts of relay A1K1 transfer the +35 volt signal to switch deck A6S1-A1. The voltage is then applied to pin N of receptacle J1 when switch A6S1 is in TUNE-1, TUNE-2, or TUNE-3 positions. Note that the overall path is either through isolation diodes A1CR16 or A1CR6 which prevent conduction in any but the correct path. Test point A1TP1 on the control circuit board provides an access point to monitor the voltage level during troubleshooting. This same voltage is simultaneously applied to pin M of receptacle J1 when switch A6S1 is in TUNE-1, TUNE-2, TUNE-3 or OPERATE.

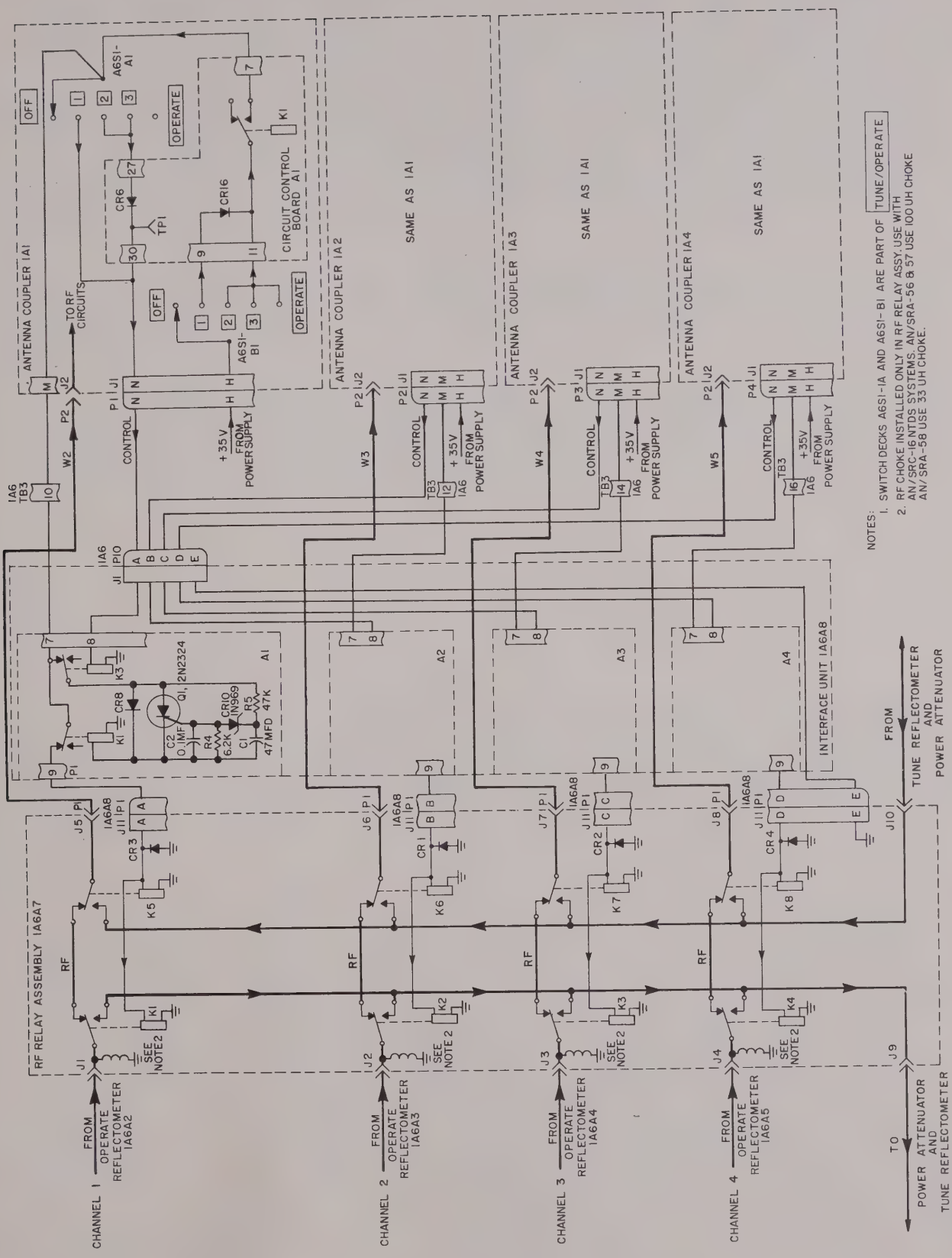


Figure 4-2. RF Relay Assembly, Simplified Schematic Diagram

The +35 volt signal is delivered from pin N of receptacle J1 on the individual antenna coupler to pins A, B, C, or D of receptacle J1 on the NTDS interface adapter unit and to the corresponding K3 relays associated with each coupler channel. The +35 volt signal from pin M of receptacle J1 is routed through a set of normally closed contacts on relay K_1 and delivered to pins A, B, C, or D of receptacle J11 on the RF relay and to the corresponding pair of relays K1 - K5, K2 - K6, K3 - K7, or K4 - K8 respectively. When one of the relay pairs is energized, the rf path is switched so that the associated transmitter RF flows through J9, power attenuator and tune reflectometer and returns to the relay assembly through J10. Diodes CR1, CR2, CR3, and CR4 are transient suppression diodes connected across the parallel coils of each relay. Pin E of rf relay receptacle J11 serves as the common DC return for the +35 volt signal that energizes the relay pairs. This pin is connected to the equipment ground at TB1 - 11

Switching A6S1 to OPERATE removes +35 volts from the coil of relay K3 thus closing its normally closed contacts. +35 volts is then delivered to the time delay circuit of Q1. After 1.5 seconds relay K_1 energizes thereby removing +35 volts to the corresponding rf relay pair.

RF chokes shown connected between J1, 2, 3, 4 are required for coupler groups used with AN/SRC-16 NTDS system to provide a DC ground on the rf transmission line. This ground is required to allow SRC-16 transmitter interlock circuitry to enable transmitter keying in the OPERATE mode. 100-microhenry chokes are used with AN/SRA-56 and 57 coupler groups. The AN/SRA-58 coupler group uses 33-microhenry chokes.

4.3.2.3 Test Data

The procedure for isolating a fault to the rf relay assembly consists of a logical choice based on observations of the RF FORWARD and RF REFLECTED power meters during normal operation or during preventive maintenance checks (see paragraph 5.2). The process of isolating the fault to a particular circuit or component consists of testing of individual relays and diodes, and continuity checks of the various rf paths. Test information concerning the rf relay assembly is presented in table 4-2.

TABLE 4-2. TEST DATA FOR RF RELAY ASSEMBLY

ITEM	CHARACTERISTICS	REMARKS
OPERATIONAL CHARACTERISTICS		
Input Impedance	50 ohms, nominal	RF circuit
Output Impedance	50 ohms, nominal	RF circuit
Insertion Loss	0 db	RF circuit
Resistance	0.04 ohms maximum	RF circuit measured from input to output

TABLE 4-2. TEST DATA FOR RF RELAY ASSEMBLY (Continued)

ITEM	CHARACTERISTICS	REMARKS
OPERATIONAL CHARACTERISTICS (Continued)		
Relay Coil Operating Voltage	+26.5 vdc	Relay circuit
Relay Coil Resistance	1300 ohms ±5% 650 ohms ±5%	Each coil Relay pair measured at J11
TEST POINTS		
5 - J1, J2, J3, J4	Continuity check	
6 - J5, J6, J7, J8	Continuity check	Relay deenergized
8 - J9	Continuity check	Relay energized
9 - J10	Continuity check	Relay energized
7 - J11-A/E, -B/E, -C/E, -D/E	Relay operation	Connect + lead to J11-A, B, C, or D
TEST EQUIPMENT		
Multimeter	AN/PSM-4 ( )	Use to check continuity and resistance of rf and relay circuits
Power Supply	+35 vdc	Use to operate relay pairs
PERFORMANCE INDICATORS		
RF POWER FORWARD	Indicates power level of transmitter	Indicates in all positions of TUNE/OPERATE switch
RF POWER REFLECTED	Indicates as specified in Section 3	
Status Indicator	NORMAL	
CRITICAL ADJUSTMENTS		
None		
REFERENCE DATA		
Functional Block Diagram	Figure 4-21	
Servicing Block Diagram	Figure 4-23	

TABLE 4-2. TEST DATA FOR RF RELAY ASSEMBLY (Continued)

ITEM	CHARACTERISTICS	REMARKS
REFERENCE DATA (Continued)		
Simplified Schematic Diagram	Figure 4-2	
Detailed Schematic Diagram	Figure 5-50	
Parts Location	Figure 5-29	
Repair Procedures	Paragraph 5.3.1.5	

4.3.3 Power Attenuator 1A6A1

Each coupler group contains a single power attenuator used in tuning the individual antenna coupler. The power attenuators in all three coupler groups are identical and completely interchangeable between groups.

4.3.3.1 Functional Description

The power attenuator is used to provide a nonreactive, nominal 50-ohm load to the transmitter so that it will not be affected during the antenna coupler tuning process. During tuning, the power attenuator provides a nonreactive source of low-level rf power at a nominal 50 ohms to the input of the antenna coupler. This enables the antenna coupler characteristics to be adjusted to provide a low vswr impedance match between the antenna coupler input and the antenna connected to the combiner output.

4.3.3.2 Circuit Description

The original power attenuator is modified by replacing R5 with a shorting bar and removing R8, as shown in figure 4-3. As shown in this figure, six nonreactive resistors are arranged in series-parallel configuration to make up the attenuator. All resistors except R9 have a value of 25 ohms; resistor R9 has a value of 37.5 ohms to bring the network up to an input/output nominal impedance of 50 ohms. RF power from the transmitter is switched to input receptacle J1, attenuated approximately 12 db, and applied to output receptacle J2, to allow coupler tuning with input power of less than 150 watts.

Each resistor is rated at 100 watts, and the power dissipation rating of the power attenuator is 200 watts. However, the power attenuator is not designed to be used on a continuous basis to provide dummy load capabilities for testing other equipments, and such use should be prohibited.

The resistor assembly is cooled by directing the exhaust air from all four antenna couplers within a cabinet through the resistor assembly. Cooling capability will be reduced when an antenna coupler is removed from the cabinet for maintenance.

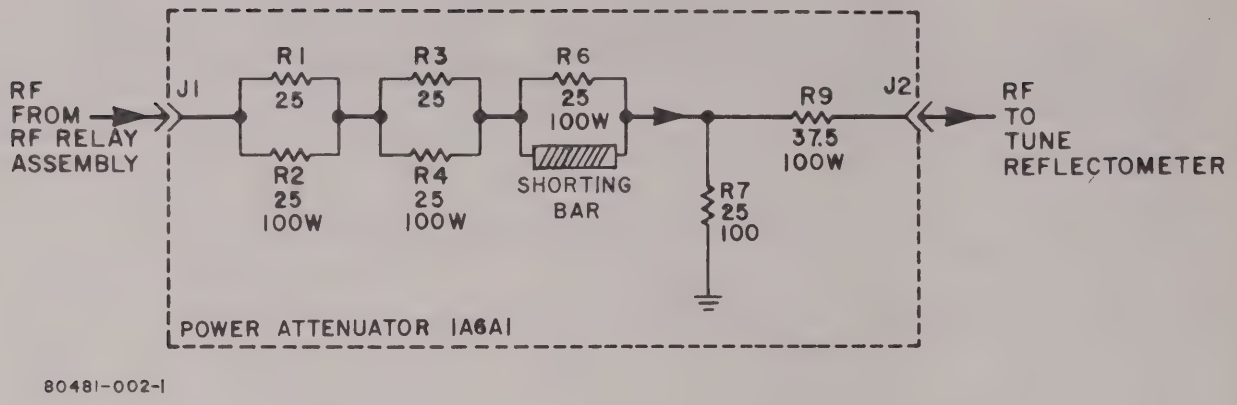


Figure 4-3. Modified Power Attenuator Schematic Diagram

4.3.3.3 Test Data

The procedure for isolating a fault to the power attenuator consists of a logical choice based on observations of the RF POWER FORWARD and RF POWER REFLECTED meters, status indicators, and transmitter during normal operation or during preventive maintenance checks. (See Paragraph 5.2). The process of isolating the fault to a particular component consists of testing of individual components and continuity checks. Test information concerning the power attenuator is presented in table 4-3.

TABLE 4-3. TEST DATA FOR POWER ATTENUATOR

ITEM	CHARACTERISTICS	REMARKS
OPERATIONAL CHARACTERISTICS		
Input Impedance	50 ohms, nominal	
Output Impedance	50 ohms, nominal	
Attenuation	12.6 db	
Power Rating	200 watts average overall; 100 watts each resistor	Intermittent duty; 30 minutes maximum operating time (fans in all four antenna couplers operating)
Frequency Range	2 to 30 mc	
TEST POINTS		
10 - J1 11 - J2	Impedance Attenuation	50 ohms nominal to ground 65.5 ohms between center conductors 12.6 db

TABLE 4-3. TEST DATA FOR POWER ATTENUATOR (Continued)

ITEM	CHARACTERISTICS	REMARKS
TEST EQUIPMENT		
Multimeter	AN/PSM-4 ( )	Used in impedance and attenuation measurements
PERFORMANCE INDICATORS		
RF POWER FORWARD	Indicates transmitter average power level	
RF POWER REFLECTED	Indicates as specified in Section 3	
Status Indicator	NORMAL	
Transmitter	Normal operation during tuning procedures	
CRITICAL ADJUSTMENTS		
None		
REFERENCE DATA		
Functional Block Diagram	Figure 4-21	
Servicing Block Diagram	Figure 4-23	
Schematic Diagram	Figure 5-50	
Repair Procedures	Paragraph 5.3.1.3	
Simplified Schematic Diagram	Figure 4-3	
Parts Location	Figure 5-27	

4.3.4 Tune Reflectometer 1A6A6

Each coupler group contains one tune reflectometer used in tuning and loading the individual antenna couplers. The tune reflectometers in all three coupler groups are identical in function and circuitry, and are completely interchangeable between groups.

4.3.4.1 Functional Description

The tune reflectometer samples the rf power between the power attenuator and the antenna coupler and generates a dc output that represents the reflected component of the rf power. When the TUNE/OPERATE switch is in the TUNE-3 position, the dc output signal is applied to the RF POWER REFLECTED meter M2 on the antenna coupler being tuned for monitoring of the reflected power during the final tuning step. The rf power passes through the tune reflectometer essentially unaffected.

The tune reflectometer is similar to the operate reflectometer except that it is more sensitive than the operate reflectometer and contains only those circuits required to sample the reflected component of the rf power. The tune reflectometer is not calibrated in reference to a particular power level, but is made as sensitive as practical to very low levels of reflected power. It also contains circuits that compress the upscale readings on the RF POWER REFLECTED meter to extend the range of reflected rf power that can be indicated on the meter, yet allow the meter to be fully effective at low levels.

4.3.4.2 Circuit Description

A simplified schematic of the tune reflectometer is shown in figure 4-4. Forward power passes from the power attenuator through the reflectometer from J1 to J2 to the antenna coupler via the rf relay assembly. RF power reflected back through the rf circuit passes through the tune reflectometer from J2 to J1. The reflectometer samples the current and voltage produced by the reflected power, compares the samples obtained, and rectifies and compresses the resultant voltage to produce the dc output. The current sample is obtained from the series-aiding coils of toroidal transformer T1 through which the center conductor of the coaxial transmission line passes. The voltage sample is obtained directly from the center conductor of the transmission line by capacitive voltage divider C1, C2, A1C1, A1C2.

When reflected power flows from J2 to J1, the current induced in the series-aiding coils of transformer T1 produces a reference voltage across resistors R1 and R2 connected in series to obtain greater sensitivity. The reference point for the circuit is established by capacitor A1C3 which places one end of resistor R1 at rf ground. The current sample voltage across series resistors R1 and R2 is 180° out of phase with the voltage sample produced by voltage divider C1, C2, A1C1, A1C2, and the voltages at the anodes and cathodes of parallel-connected diodes A1CR1, A1CR2 are of opposite polarity. Diodes A1CR1 and A1CR2 conduct during the half cycle that the voltage across the capacitive voltage divider is negative with respect to the voltage across resistors R1 and R2, but do not conduct when the voltage across the voltage divider is positive with respect to that across resistors R1 and R2. The positive voltage developed during the latter half cycle causes a current to flow to the return side of the circuit through choke A1L1, the TUNE/OPERATE switch A6S1 on the antenna coupler being tuned (when switch A6S1 is in the TUNE-3 position), and the RF POWER REFLECTED meter M2.

Inductor A1L1 provides a high reactance to the rf component at the junction of the diodes and the voltage divider, and a low resistance to the dc component. Capacitor A1C4 filters the dc signal to eliminate rf from being applied to A1Q1 and the metering circuit. Transistor A1Q1 with its base tied to the collector acts as a variable shunt across meter M2. As the voltage between pins C and B on receptacle J3 rises, transistor A1Q1 conducts harder to shunt a portion of the dc current around the meter. This results in a compression of the meter scale at high levels of reflected power since the dc current is no longer proportional to the reflected power sampled.

When no reflected, but only forward power is present, the polarity of the voltage produced by the current sample is reversed. Thus, forward rf power flowing from J1 to J2 induces a current in the coils of transformer T1 to develop a voltage across R1 and R2 that is in phase with the voltage across voltage divider C1, C2, A1C1, A1C2. The voltages at the anodes and cathodes of parallel diodes A1CR1-A1CR2 are of the same polarity. During alignment, capacitor A1C2 is adjusted so that the voltages at the terminals of the diodes are also equal. Under these conditions, diodes A1CR1 and A1CR2 do not conduct; thus no dc is developed to drive the reflected power circuit.

4.3.4.3 Test Data

The procedure for isolating a fault to the tune reflectometer consists of a logical choice based on observations of the RF POWER FORWARD and RF POWER REFLECTED meters during

TABLE 4-6. TEST DATA FOR RF CIRCUITS (Continued)

ITEM	CHARACTERISTICS	REMARKS
REFERENCE DATA (Continued)		
Simplified Schematic Diagram	Figure 4-5 Figure 4-6	RF circuit Electronic Q control
Detailed Schematic Diagram	Figure 5-51	
Parts Location	Figure 5-36 Figures 5-33 through 5-35	RF components Electronic Q control components
Repair Procedures	Paragraphs 5.3.1.9 through 5.3.1.12 Paragraph 5.3.1.8	Bandpass filter Electronic Q control
Alignment Procedures	Paragraph 5.2.2.3.5	

4.3.5.3.2 Operational Controls

The operational controls consist of five front panel controls that enable the antenna to be tuned in the prescribed sequence and operated in an established manner. The basic control is the TUNE/OPERATE switch that provides overall control of the channel. The input resonator (FREQ ADJUST INPUT) and output resonator (FREQ ADJUST OUTPUT) tuning controls are used for tuning the bandpass filter of the rf section to pass the desired signal and reject all others. The output coupling adjustment (OUTPUT COUPLING) control is used for adjusting the coupling of the bandpass filter to the combiner to establish a low vswr impedance match between the antenna coupler input and the load connected to the output of the combiner. The emergency bypass (EMERGENCY) switch enables the antenna coupler to continue to operate under certain fault conditions.

4.3.5.3.2.1 TUNE/OPERATE Switch A6S1S2

The TUNE/OPERATE switch selects the required circuits to monitor the performance of the channel and to protect the transmitter and coupler group during tuning and operation of the antenna coupler. The TUNE/OPERATE switch A6S1 is a five-position rotary switch mounted at the left center of the antenna coupler front panel. It is a three-deck switch having two poles per deck and five positions per pole with a contact rating of 5 amperes at 28 vdc. Decks one and two are make-before-break, and deck three is break-before-make. The TUNE/OPERATE switch also contains, as an integral part of the assembly, a pushbutton switch (A6S2) that functions between positions 4 and 5.

The five positions of the TUNE/OPERATE switch are OFF, TUNE-1, TUNE-2, TUNE-3, and OPERATE, with a PUSH TO TURN requirement between the TUNE-3 and OPERATE positions. In the OFF position, the TUNE/OPERATE switch deactivates the control circuits and monitoring devices of the antenna coupler. The output resonator is shorted to completely decouple the channel from other channels in the group.

In the TUNE-1 position, the TUNE/OPERATE switch selects the circuits required for tuning the input resonator of the bandpass filter in the rf section. The TUNE/OPERATE switch activates the control circuits that energize the associated relay pair in the rf relay assembly via the NTDS interface to switch the transmitter rf power to the power attenuator. The short across the output resonator is maintained so that the input resonator can be tuned for maximum voltage without being loaded by the output resonator. The switch also connects the input resonator voltage sensor A2 to the RF POWER REFLECTED meter for monitoring of the input resonator voltage during tuning.

In the TUNE-2 position, the TUNE/OPERATE switch selects the circuit required for tuning the output resonator of the bandpass filter. The switch maintains the same conditions as in the TUNE-1 position except that it activates control circuits to remove the short from the output resonator. The input resonator voltage is monitored for a minimum value on the RF POWER REFLECTED meter as the output resonator is tuned.

In the TUNE-3 position, the TUNE/OPERATE switch selects the circuits required for loading the antenna coupler by adjusting the output coupling. The switch maintains the same conditions as in the TUNE-2 position, except that it connects the tune reflectometer 1A6A6 to the RF POWER REFLECTED meter (in place of input resonator voltage sensor A2) for monitoring very low levels of reflected power during adjustment of output coupling. In the original equipment after the antenna coupler is properly adjusted, the TUNE/OPERATE switch is depressed (PUSH TO TURN). This switch position activates the pushbutton switch A6S2. When the TUNE/OPERATE switch is released, A6S2 contacts are closed. These contacts are not used in the NTDS adapter unit.

In the OPERATE position, the TUNE/OPERATE switch selects the circuits required for normal operation of the antenna coupler. The switch activates control circuits that deenergize the associated relays in the rf relay assembly via the NTDS interface to switch the transmitter rf path directly into the rf section of the antenna coupler. The switch connects the output of the associated operate reflectometer (1A6A2, 1A6A3, 1A6A4 or 1A6A5) on the RF POWER REFLECTED meter so that the reflected power can be monitored during operation.

4.3.5.3.2.2 FREQ ADJUST INPUT Control

The FREQ ADJUST INPUT control is provided for tuning the input resonator of the bandpass filter in the rf section. This control consists of a rotary control knob (mounted on the right side of the front panel) connected by means of a geared drive assembly and driveshaft to the tuning capacitor of the input resonator. Also connected to the geared drive assembly is a horizontally moving, flexible steel tape dial. This frequency indicating tape is calibrated within 2 percent of the resonant frequency of the input resonator in the frequency range over which the antenna coupler operates. The tape is calibrated from 1.9 to 6.4 mc for Antenna Coupler CU-1774/SRA-56, from 3.9 to 13.0 mc for Antenna Coupler CU-1774/SRA-57; and from 9.5 to 32.0 mc for Antenna Coupler CU-1776/SRA-58. Positive stops on the control prevent overdriving the tuning capacitor in either direction. A locking device enables the control to be locked at any desired position.

4.3.5.3.2.3 FREQ ADJUST OUTPUT Control

The FREQ ADJUST OUTPUT control is provided for tuning the output resonator of the bandpass filter in the rf section. This control, also mounted on the right side of the front panel, is identical to the FREQ ADJUST INPUT control.

4.3.5.3.2.4 OUTPUT COUPLING Control

The OUTPUT COUPLING control is provided for adjusting the position of the output link with respect to the inductor of the output resonator, thus controlling the degree of inductive

coupling for loading the antenna coupler. The OUTPUT COUPLING control consists of a rotary control knob (mounted on the lower left side of the front panel) connected through a chain-drive assembly to the link-drive screw shaft mounted on the left side of the bandpass filter box. Mounted on the screw shaft is a mating block that contacts and operates the cabinet-mounted slide mechanism within the equipment cabinet to physically move the output link in and out of the antenna coupler. This mechanism also activates the coupling control switch S1 described under the control circuit section (see paragraph 4.3.5.3.4.5). Also connected to the chain drive assembly is a three-digit rotary counter that indicates the relative position of the output link with respect to the output resonator. Positive stops on the control prevent overdriving the output coupling link assembly in either direction. A locking device enables the output coupling link to be locked in any desired position.

4.3.5.3.2.5 EMERGENCY Switch S3

An EMERGENCY switch is provided to enable the antenna coupler to continue to operate under certain fault conditions by bypassing the associated protective circuits. The protective circuits that are bypassed by this switch are the loss-of-air-flow, excessive vswr, and overvoltage (see paragraphs 4.3.5.3.4.6 and 4.3.5.3.4.7). When operated to ON position, the EMERGENCY switch removes the fault signal from the control relay circuit; it also by-passes the NTDS inhibit signal and, thereby, permits the antenna coupler to operate in an emergency mode.

4.3.5.3.2.6 Test Data

The procedures for testing the operational control section are limited to visual inspections and electrical continuity checks of the contacts of the TUNE/OPERATE and EMERGENCY switches, and visual inspection and mechanical alignment of the FREQ AJUST INPUT, FREQ ADJUST OUTPUT, and OUTPUT COUPLING controls, drive mechanisms, and indicator devices. See paragraph 5.2.2.3.3 for alignment and paragraph 5.3.1.8 for repair information.

4.3.5.3.3 Monitoring Section

The monitoring section consists of indicating devices and circuits that (1) provide the operator with visual indications required for tuning and operating the antenna coupler properly, and (2) provide the control circuit signals required to ensure that the tuning sequence is performed correctly and that the equipment is protected from the effects of a malfunction. The monitoring section consists of two voltage sensors, two front panel meters, an airflow sensor, and four front panel indicator lamps.

4.3.5.3.3.1 Voltage Sensors A2 and A3

These two voltage sensors are identical in circuitry but perform different functions. Voltage sensor A2 samples the input resonator rf voltage and produces a dc signal which is fed to the RF POWER REFLECTED meter during tuning of the input, and initial tuning of the output, resonators. Voltage sensor A3 samples the output resonator rf voltage and produces a dc signal which is fed to the overvoltage control circuit in the control circuit section (see paragraph 4.3.5.3.4.7). This circuit operates protective devices to shut down the transmitter and antenna coupler if the output resonator voltage rises to an excessive value.

A simplified schematic diagram of the voltage sensor is shown in figure 4-7. The resonator rf voltage is sampled by a capacitive probe that extends into the resonator compartment. This sampled rf is rectified by diode CR1 and filtered by the RC network formed by resistors R1, R2, and capacitor C2. The dc output signal is developed across resistor R2 which is variable to permit the voltage sensor dc output to be adjusted. During the control system calibration

(paragraph 5.2.1.5.4), resistor *R2* of voltage sensor A2 is adjusted to obtain 150 watts on RF POWER REFLECTED meter when the voltage between E4 and E1 is 0.48 vdc (CU-1772/SRA-56), 0.12 vdc (CU-1774/SRA-57), or 0.07 vdc (CU-1776/SRA-58). Resistor R2 of voltage sensor A3 is adjusted to shut down the antenna coupler when the voltage between E4 and E1 is 42.8 vdc (CU-1772/SRA-56), 26.8 vdc (CU-1774/SRA-57) or 32.1 vdc (CU-1776/SRA-58). All voltage sensors within all antenna couplers in all coupler groups are completely interchangeable provided that they are properly adjusted during the control system calibration procedures.

4.3.5.3.3.2 RF POWER Meters M1 and M2

Two meters, RF POWER FORWARD and RF POWER REFLECTED, on the front panel are used by the operator in tuning and operating the antenna coupler. The RF POWER FORWARD meter M1 continuously displays the forward rf component of the transmitter power into the channel as sampled by the operate reflectometers, 1A6A2, 1A6A3, 1A6A4, or 1A6A5. Depending upon the position of the TUNE/OPERATE switch, the RF POWER REFLECTED meter M2 displays (1) the input resonator voltage as sampled by voltage sensor A2, (2) the low-level reflected rf power of the input of the antenna coupler as sampled by the tune reflectometer 1A6A6, or (3) the high-level reflected rf power at the input to the channel as sampled by the associated operate reflectometer.

The rf power meter circuits are shown in the simplified schematic diagram in figure 4-8. Both meters M1 and M2 are 0-100 microammeters with a resistance of 1250±125 ohms and an accuracy of 2 percent of full scale reading. RF POWER FORWARD meter M1 is scaled to indicate 0 to 1.5 kw; RF POWER REFLECTED meter M2 is scaled to indicate 0 to 250 watts.

As shown in figure 4-8, the RF POWER FORWARD meter M1 is connected continuously across the output terminals of the forward rf power section of the operate reflectometer through pins A and B of receptacle J1. When the TUNE/OPERATE switch A6S1 is in TUNE-1 or TUNE-2 positions, the RF POWER REFLECTED meter M2 is connected across the output terminals of input resonator voltage sensor A2 to monitor the input resonator rf voltage. When the TUNE/OPERATE switch is in the TUNE-3 position, meter M2 is connected across the output terminals of the tune reflectometer 1A6A6 through pins D and E of antenna coupler receptacle J1. When the TUNE/OPERATE switch is in OPERATE, meter M2 is connected across the output terminals of the reflected rf power section of the operate reflectometer through pins C and B of receptacle J1 and through resistor A1R24 on circuit control board A1. Resistor A1R24 is a precision calibration resistor that is a functional part of the operate reflectometer circuit (see paragraph 4.3.1). This circuit also provides continuously a monitoring circuit through a parallel connection for the excessive reflected power control circuit in the control circuit section (see paragraph 4.3.5.3.4.7).

4.3.5.3.3.3 Air Flow Sensor Switch S2 and Indicator Circuit

When ac is applied to the coupler group, the ac distribution circuits provide 115 vac to operate the fans in all antenna couplers. The air flow generated by the fans is monitored by an air flow sensor located on the bottom of the bandpass filter box. When the air flow becomes inadequate, the sensor switch closes to activate loss-of-air-flow protective circuits within the antenna coupler (see paragraph 4.3.5.3.4.6).

A simplified schematic of the air flow sensor and indicator circuit is shown in figure 4-9. When TUNE/OPERATE switch is in any position but OFF, +35 vdc is applied to the NC contact of air flow sensor switch S2. Switch S2 is a vane operated switch located in the air stream of the fan. When the air stream is adequate, switch S2 closes to the NO contact and applies dc common to the air flow indicator circuit. When the air stream becomes inadequate, switch S2 closes to the NC contact and +35 volts is applied through pin 10 on circuit control board A1, the loss-of-air-flow protective circuit in the control circuit section, current limiting resistor 1AR5, and pin 16 on the control board, to light AIR FLOW indicator lamp DS3. The loss-of-air-flow protective circuit

TABLE 4-7. TEST DATA FOR MONITORING CIRCUITS (Continued)

ITEM	CHARACTERISTICS	REMARKS
PERFORMANCE INDICATORS (Continued)		
Air Flow Sensor and Indicator		
AIR FLOW	Out	
ALARM	Silent	
Fan	Operates	
CRITICAL ADJUSTMENTS		
Voltage Sensor A2	A2R2	Calibrates RF POWER REFLECTED meter used in tuning input and output resonators
Voltage Sensor A3	A3R2	Sets trip level for overvoltage protective circuit
REFERENCE DATA		
Functional Block Diagram	Figure 4-22	
Servicing Block Diagram	Figure 4-24	
Simplified Schematic Diagram	Figure 4-7 Figure 4-8 Figure 4-9 Figure 4-10	Voltage sensors RF power meters Air flow sensor and indicators Status indicators
Detailed Schematic Diagram	Figure 5-51	
Parts Location	Figure 5-5 Figure 5-6 Figure 5-30	Monitoring devices Voltage sensor RF power meters and status indicators
Repair Procedures	Paragraph 5.3.1.17	
Calibration Procedures	Paragraph 5.2.1.5.4	

If the primary power (115 vac) is removed from the coupler group, the automatic reset circuit resets the control relay circuit to its original condition as the primary power is restored. The automatic decoupling circuit places a short across the output resonator to completely decouple the antenna coupler (channel) from the coupler group when the antenna coupler is off,during certain tuning steps, or when a malfunction of the equipment occurs. The coupling control circuit ensures that the output resonator is properly decoupled or coupled as required during the tuning or operating procedures. The rf relay control and inhibit circuits energize and deenergize the appropriate

relay pair in the rf relay assembly during tuning and operation, and establish priority of access to the power attenuator and tune reflectometer between the four antenna couplers within a cabinet. The loss-of-air-flow circuit shuts down the affected antenna coupler and associated transmitter to protect the equipment from damage that might be caused by a rise in temperature within the antenna coupler. The excessive vswr circuit protects the antenna coupler and transmitter from damage due to excessive reflected power caused by a malfunction of the equipment. The overvoltage circuit protects the antenna coupler from damage caused by an excessive rise in the output resonator voltage level during tuning or operation of the antenna coupler.

Most of the components of the control circuits are located on the printed circuit control board A1. Each antenna coupler contains one circuit control board, and all circuit control boards in all antenna couplers within all three coupler groups are identical in function and circuitry. These printed circuit boards are completely interchangeable between antenna couplers or coupler groups, provided that excessive vswr calibration resistor A1R21 is properly adjusted.

4.3.5.3.4.1 Control Relay Circuit

4.3.5.3.4.1.1 Functional Description

The fundamental circuit of the control section is the control relay circuit shown in the simplified schematic diagram, figure 4-11. This circuit provides the overall antenna coupler control by the energized/deenergized state of control relay A1K1. Relay A1K1 is energized when the tuning and operation of the antenna coupler is acceptable. When improper tuning or operation procedures are followed or a malfunction occurs with the equipment, relay A1K1 deenergizes and shuts down the antenna coupler. The circuit operates in the following manner.

Plus 35 volts from the power supply is applied to pin H of receptable J1 on the antenna coupler and fed to TUNE/OPERATE switch deck A6S1-B1. When the TUNE/OPERATE switch is in the TUNE-1 position, +35 vdc is routed through pin 9 on the circuit control board directly to the coil of relay A1K1, and the path to ground is through zener diode VR2 and resistor R2. This causes relay A1K1 to energize, closing contacts B2-B1 (not used) and circuit control contacts A2-A1. When contacts A2-A1 close, +35 vdc is applied through diodes CR16 and CR17 to the coil of relay A1K1 and the relay is latched in the energized state. When the TUNE/OPERATE switch is switched to TUNE-2, TUNE-3, or OPERATE position, the +35 vdc is applied to relay A1K1 through pin 11 of the circuit control board, closed contacts A2-A1, and diode CR17 to maintain the relay in the energized condition.

If the dc power to antenna coupler should fail due to a loss of primary ac power, relay A1K1 will deenergize. When power is restored, an automatic reset circuit causes relay A1K1 to be reenergized at any position of the TUNE/OPERATE switch without returning the TUNE/OPERATE switch to TUNE-1 position.

Under normal operation, relay A1K1 remains energized and +35 vdc is available through closed contacts A2-A1 and pin 7 of the circuit control board to operate the inhibit circuit, the automatic decoupling switch circuit and provide the signal +35 VDC IN TUNE to the interface adapter unit. However, relay A1K1 will deenergize if (1) the output coupling is not adjusted properly, (2) an attempt is made to tune the antenna coupler while another coupler is being tuned, (3) a malfunction occurs that results in a loss-of-air-flow, excessive output resonator voltage, or excessive reflected power, or (4) NTDS adapter issues an INHIBIT command.

The circuits that control this function apply +35 vdc to the ground side of relay K1 and eliminate the potential difference across its coil necessary to maintain the relay in the energized state. Zener diode VR2 ensures positive action.

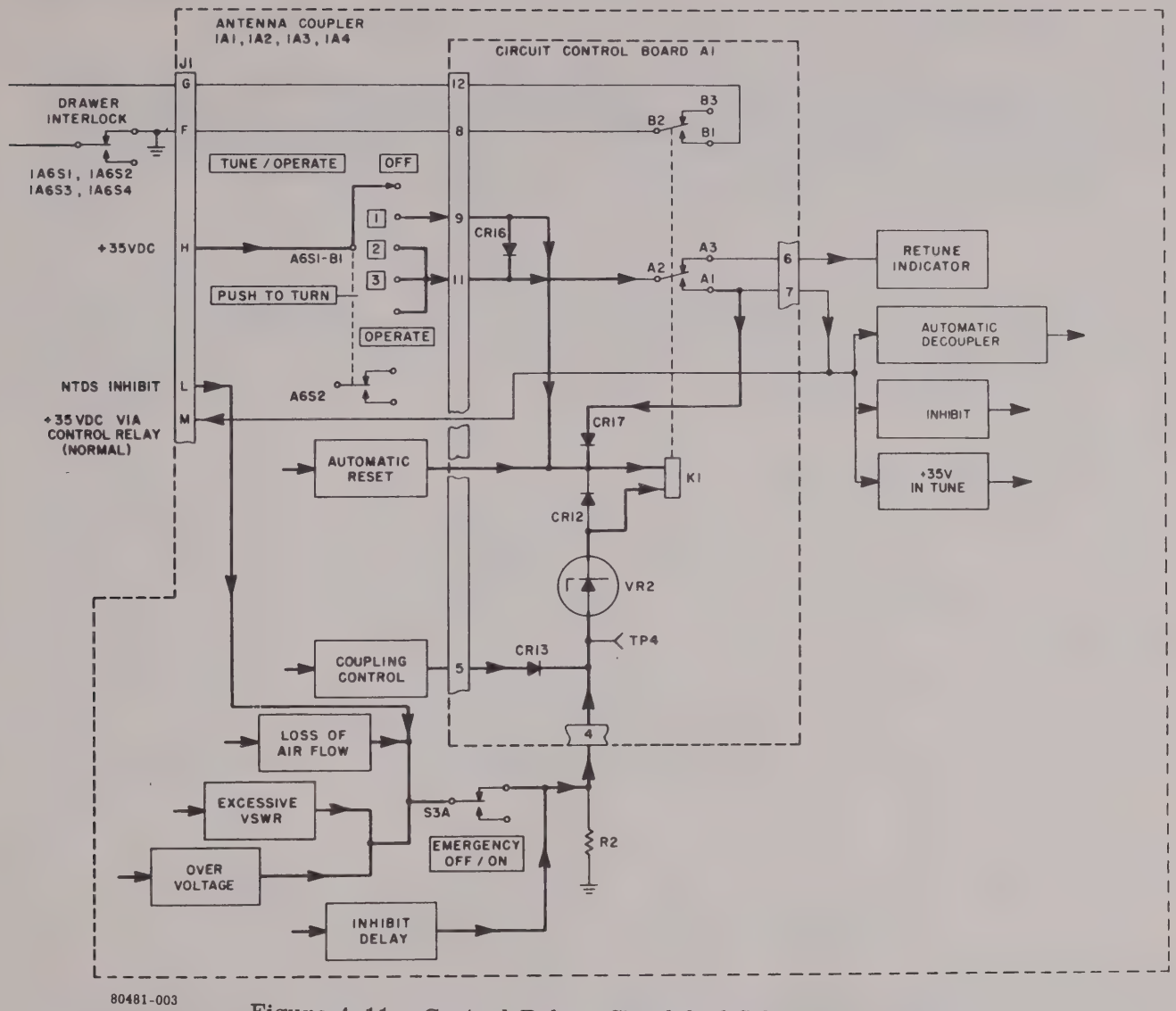


Figure 4-11. Control Relay, Simplified Schematic Diagram

When this occurs, relay contacts A2-A1 open to shut down the antenna coupler. This removes the +35 vdc from the interface adapter unit and inhibit circuit, and the solenoid of the automatic decoupling circuit. Plus 35 vdc is then applied through contacts A2-A3 and pin 6 on the circuit control board to light the RETUNE indicator.

When the EMERGENCY switch S3 is operated on ON, the loss-of-air-flow, excessive vswr, NTDS INHIBIT and overvoltage protective circuits are bypassed to permit the antenna coupler to operate in an emergency mode. Operating the EMERGENCY switch to ON remove any fault control signal produced by these protective circuits from the anode of zener diode VR2. However, the coupling control and inhibit control signals cannot be bypassed, and the antenna coupler will shut down if the coupling is not properly adjusted or if an attempt is made to tune the antenna coupler while another antenna coupler is in the tune mode.

The drawer interlock circuit shown in figure 4-11 provides the NTDS ALARM line ground, preventing the transmitter from operating unless the antenna coupler is secured in position within the equipment cabinet.

4.3.5.3.4.1.2 Test Data

The procedure for isolating a fault to the control relay circuit consists of a logical choice based on observations of the status indicators, and transmitter during normal operation or during preventive maintenance checks (see paragraph 5.2). The process of isolating the fault to a particular component of the circuit consists of continuity checks and testing of individual components. Test information concerning the control relay circuit is presented in table 4-8.

TABLE 4-8. TEST DATA FOR CONTROL RELAY CIRCUIT

ITEM	CHARACTERISTICS	REMARKS
OPERATIONAL CHARACTERISTICS		
Control Relay A1K1 Energizing voltage Coil resistance	 28.8 vdc 640 ohms	
A1TP4	+4 vdc (approximately) + 35 vdc	Quiescent state Deenergizes A1K1
TEST POINTS		
H - J1-H/T	+35 vdc application point	Connect + lead to J1-H
T - A1TP4	Monitors and checks operation of control relay	Connect + lead to A1TP4, - lead to chassis ground
TEST EQUIPMENT		
Power Supply	+35 vdc, 0.4 amperes	Use coupler group power supply if available
Control System Cable and Test Set (Special)	See paragraph 5.2.1.2.1	See paragraph 5.2.1.5.4.3 for procedures to check control relay operation
Multimeter	AN/PSM-4 ( )	Used for continuity checks and component testing
PERFORMANCE INDICATORS		
Status Indications	As specified in Section 3	
Transmitter	As specified in Section 3	

TABLE 4-8. TEST DATA FOR CONTROL RELAY CIRCUIT (Continued)

ITEM	CHARACTERISTICS	REMARKS
CRITICAL ADJUSTMENTS		
None		
REFERENCE DATA		
Functional Block Diagram	Figure 4-22	
Servicing Block Diagram	Figure 4-24	
Simplified Schematic Diagram	Figure 4-11	
Detailed Schematic Diagram	Figure 5-51	
Parts Location	Figure 5-45	
Repair Procedures	Paragraphs 5.3.1.7 and 5.3.1.17	
Fault Isolation Procedures	Paragraphs 5.2.1.5.1 and 5.2.1.5.4	

4.3.5.3.4.2 Automatic Reset Circuit

4.3.5.3.4.2.1 Functional Description

If dc power is removed from control relay A1K1 by a failure of the primary ac power, the relay will deenergize. When power is restored to the antenna coupler, relay A1K1 will energize if the TUNE/OPERATE switch is in TUNE-1. To enable the relay to reenergize in other positions of the TUNE/OPERATE switch, an automatic reset circuit is provided. A simplified schematic diagram of the automatic reset circuit is shown in figure 4-12.

As +35 vdc is reapplied to the antenna coupler through pin H of receptacle J1, it is fed to the automatic reset circuit through pin 2 of the circuit control board A1 to capacitor A1C9. Capacitor A1C9 begins to charge through the lowest impedance path consisting of the coil of relay A1K1, and momentarily closes contacts A2-A1. If +35 vdc is also present at relay contact A2, relay A1K1 will latch in the energized condition. However, if +35 vdc is not available at contact A2, the relay will not latch and, since the current decreases as capacitor A1C9 becomes fully charged, relay A1K1 will deenergize and the contacts will open.

Because of the configuration of the control relay circuit, any of the fault conditions that present +35 vdc at the base of zener diode A1VR2 will prevent relay A1K1 from energizing, and the automatic reset circuit will not energize the relay since no difference of potential will exist across the coils of the relay.

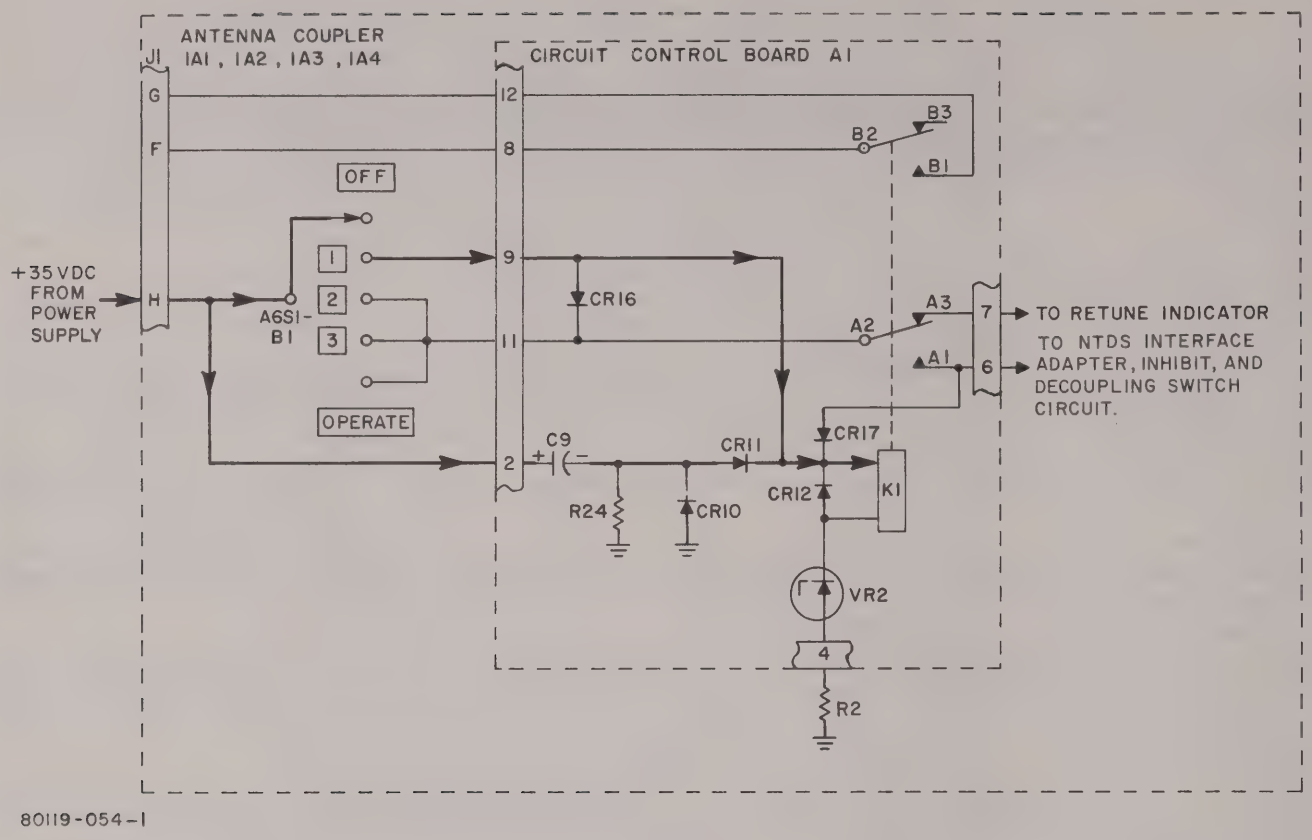


Figure 4-12. Automatic Reset Circuit, Simplified Schematic Diagram

4.3.5.3.4.2.2 Test Data

The procedure for isolating a fault to the automatic reset circuit consists of a logical choice based on observations of the status indicators when power is restored to the antenna coupler after a power interrupt or during preventive maintenance checks (see paragraph 5.2). The process of isolating the fault to a particular component within the circuit consists of continuity checks and testing of individual components. Test information concerning the automatic reset circuit is presented in table 4-9.

TABLE 4-9. TEST DATA FOR AUTOMATIC RESET CIRCUIT

ITEM	CHARACTERISTICS	REMARKS
TEST POINTS		
H - J1-H/T	+35 vdc application point	Connect + lead to J1-H
T - A1TP4	Control relay operation	Connect + lead to TP4, - lead to ground
TEST EQUIPMENT		
Power Supply	+35 vdc, 0.4 amperes	Use coupler group power supply if available

TABLE 4-10. TEST DATA FOR AUTOMATIC DECOUPLING CIRCUIT

ITEM	CHARACTERISTICS	REMARKS
OPERATIONAL CHARACTERISTICS		
Shorting Switch A5 Coil resistance	0.35 ohm	
TEST POINTS		
H - J1-H/T	+35 vdc application point	Connect + lead to J1-H
TEST EQUIPMENT		
Power Supply	+35 vdc	Use coupler group power supply if available
Control System Cable and Test Set (Special)	See paragraph 5.2.1.2.1	See paragraph 5.2.1.5.4.3 for procedures to check the automatic coupling circuit
Multimeter	AN/PSM-4 ( )	Use for continuity checks and component testing
PERFORMANCE INDICATORS		
RF POWER FORWARD	As specified in Section 3	
RF POWER REFLECTED	As specified in Section 3	
Status Indicator	NORMAL	
CRITICAL ADJUSTMENTS		
None		
REFERENCE DATA		
Functional Block Diagram	Figure 4-22	
Servicing Block Diagram	Figure 4-24	
Simplified Schematic Diagram	Figure 4-13	
Detailed Schematic Diagram	Figure 5-51	

TABLE 4-10. TEST DATA FOR AUTOMATIC DECOUPLING CIRCUIT (Continued)

ITEM	CHARACTERISTICS	REMARKS
REFERENCE DATA (Continued)		
Parts Location	Figure 5-5 Figure 5-30 Figure 5-45	Shorting switch A5 TUNE/OPERATE switch Circuit control board
Repair Procedures	Paragraphs 5.3.1.7 and 5.3.1.17	
Fault Isolation Procedures	Paragraph 5.2.1.5.4.3	

4.3.5.3.4.4 +35 VDC IN TUNE and INHIBIT Circuit

4.3.5.3.4.4.1.1 Functional Description

The +35 vdc IN TUNE and inhibit circuit provides individual antenna coupler status information necessary to ensure proper control of the rf relay. When +35 vdc is connected to the associated pair in the rf relay assembly (see Paragraph 4.3.2), the power attenuator and tune reflectometer are inserted in the rf transmission line at a coupler input. Refer to figure 4-14 for circuit details.

Since four antenna couplers share a common power attenuator and tune reflectometer, only one coupler of a group can be permitted to be tuned at a given time. Referring to figure 4-14, a particular coupler is in tune when the TUNE/OPERATE switch (A6S1) is in position 1, 2, or 3, and the control relay K1 is energized. Under these conditions, +35 vdc will be present at J1, pin 1 via J1, pin H, A6S1B1, CR16, K1A1, A6S1B2, and CR6. This +35 vdc IN TUNE signal provides coupler status information to the interface adapter. This same signal is routed through steering diodes CR1, 2 and 3 to provide inhibit signals to the other three couplers of the group.

Plus 35 vdc from the power supply appears at TUNE/OPERATE switch deck A6S1-A1 through pin 6, circuit control relay A1K1 closed contacts A2-A1, and pins 9 or 11 of the circuit control board A1; switch deck A6S1-B1; and pin H of antenna coupler receptable J1. TUNE/OPERATE switch deck A6S1-A1 applies +35 vdc to the NTDS interface through pin N of receptacle J1 directly when the TUNE/OPERATE switch is in TUNE-1, and through pin 27, diode CR6, and pin 30 on the circuit control board when the TUNE/OPERATE switch is in TUNE-2 or TUNE-3 positions. When the TUNE/OPERATE switch is in the OFF and OPERATE positions, +35 vdc is not presented to the NTDS adapter via J1 pin N, nor does it produce an inhibit output to the other antenna couplers. The NTDS interface generates the RF relay select signal based on the J1-pin N signal.

Plus 35 volts also appears at the anodes of diodes CR1, CR2, and CR3 to form the inhibit circuitry. The +35 vdc is applied to the inhibit delay circuit in the other three antenna couplers in the coupler group through pins 34, 32, and 31 on circuit control board A1, and pins P, R, and S, respectively, on antenna coupler receptable J1. This voltage appears at pin J of receptable J1 in the other antenna couplers.

If another antenna coupler is being tuned, the inhibit circuit of that antenna coupler will present, at pin J of receptacle J1, +35 vdc input to the inhibit delay circuit. This voltage is

connected to the collector of emitter follower transistor A1Q4 through pin 1 on the circuit control board. Conduction of transistor A1Q4 is controlled by the voltage across capacitor A1C11 which increases as A1C11 charges toward +35 vdc through resistor A1R23. The voltage across resistor R26 increases toward +35 volts as transistor A1Q4 reaches full conduction. This voltage is applied to the anode of zener diode A1VR2 through switch deck A6S1-A2 and pin 4 of the circuit control board when the TUNE/OPERATE switch is in the TUNE-1, TUNE-2 or TUNE-3 position. Circuit control relay A1K1 deenergizes, shuts down the antenna coupler, and removes the +35 vdc from switch deck A6S1-A1, thus preventing the rf relay pair from being energized by the NTDS adapter.

An INHIBIT signal from the NTDS interface arriving via J1 pin L will also deenergize the control relay providing S3 (EMERGENCY) is set to the OFF position.

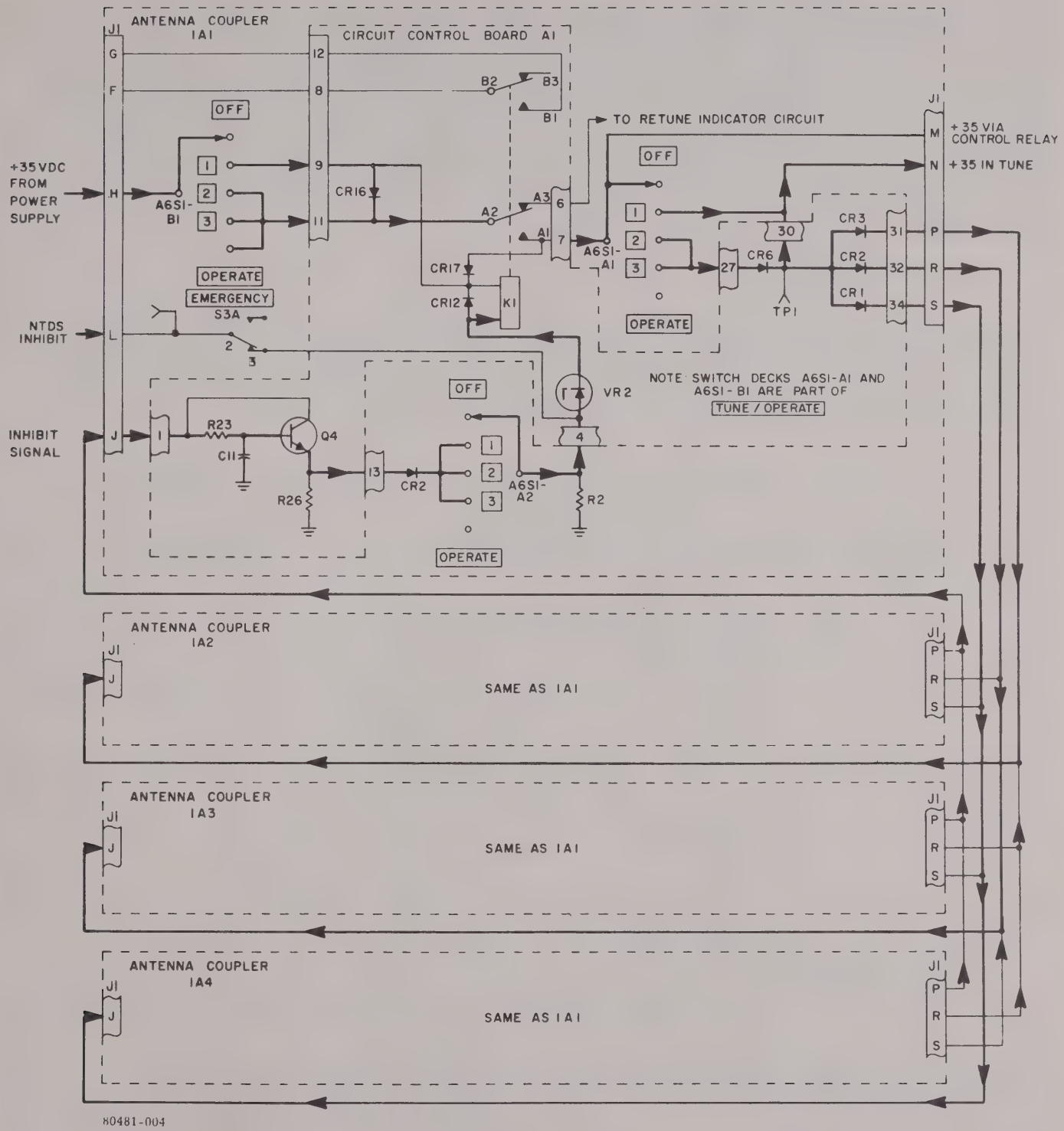


Figure 4-14. Tune Indication and Inhibit, Simplified Schematic Diagram

The time constant of the RC network formed by resistor A1R23 and capacitor A1C11 is approximately 20 milliseconds which provides a short delay to establish priority during tuning. When one antenna coupler is in the TUNE mode and an attempt is made to tune a second antenna coupler, the first antenna coupler will have priority, and the second will be shut down immediately since its transistor A1Q4 will already be at full conduction because of the inhibit signal produced at pin J by the first antenna coupler which is already in the TUNE mode. The second antenna coupler will produce an inhibit signal that will appear at pin J on the first antenna coupler since the second antenna coupler A1K1 contacts may momentarily close, then open, but the duration of the inhibit signal is not long enough to cause transistor A1Q4 to conduct sufficiently to deenergize circuit control relay A1K1 in the first antenna coupler. Thus, the first antenna coupler will not shut down.

4.3.5.3.4.4.2 Test Data

The procedure for isolating a fault to the rf relay control and inhibit circuit consists of a logical choice based on observations of the status indicators during normal operation or during preventive maintenance checks (see paragraph 5.2). The process of islating the fault to a particular component consists of continuity checks and testing of individual components. Test information concerning the rf relay control and inhibit circuit is presented in table 4-11.

TABLE 4-11. TEST DATA FOR RF RELAY CONTROL AND INHIBIT CIRCUIT

ITEM	CHARACTERISTICS	REMARKS
TEST POINTS		
H - J1-H/T	+35 vdc application point	Connect + lead to J1-H
M - J1-J/T	Inhibit input	Connect + lead to J1-J
Q - A1TP1	Monitors output of inhibit circuit	Connect + lead to TP1, - lead to chassis ground
U - J1-N/T	RF relay control signal	Connect + lead to J1-N
V - J1-P/T	Inhibit output 1	Connect + lead to J1-P
W - J1-R/T	Inhibit output 2	Connect + lead to J1-R
X - J1-S/T	Inhibit output 3	Connect + lead to J1-S
TEST EQUIPMENT		
Power Supply	+35 vdc, 0.4 amperes	Use coupler group power supply if available
Control System Cable and Test Set (Special)	See paragraph 5.2.1.2.1	See paragraphs 5.2.1.5.1.3 and 5.2.1.5.4.3 for procedures to check rf relay and inhibit circuits
Multimeter	AN/PSM-4 ( )	Used for continuity checks and component testing

TABLE 4-11. TEST DATA FOR RF RELAY CONTROL AND INHIBIT CIRCUIT (Continued)

ITEM	CHARACTERISTICS	REMARKS
PERFORMANCE INDICATORS		
Status Indicators	NORMAL	During normal operation as specified in Section 3
CRITICAL ADJUSTMENTS		
None		
REFERENCE DATA		
Functional Block Diagram	Figure 4-22	
Servicing Block Diagram	Figure 4-24	
Simplified Schematic Diagram	Figure 4-14	
Detailed Schematic Diagram	Figure 5-51	
Parts Location	Figure 5-30 Figure 5-45	TUNE/OPERATE switch Circuit control board
Repair Procedures	Paragraph 5.3.1.7 Paragraph 5.3.1.17	
Fault Isolation Procedures	Paragraph 5.2.1.5.1.3 Paragraph 5.2.1.5.4.3	

4.3.5.3.4.5 Coupling Control Circuit

4.3.5.3.4.5.1 Functional Description

During the tuning procedures, the output coupling link must be in the minimum coupling position when tuning the input and output resonators, variable during loading of the antenna coupler, and in a coupled position when the antenna coupler becomes operational. A simplified schematic diagram of the coupling control is shown in figure 4-15.

The link coupling switch S1 is a microswitch that is operated to the NO or NC positions by the drive assembly on the OUTPUT COUPLING control. When the output coupling link is in the minimum coupling position switch S1 is operated to the NO position. If the control is not in this position, the switch is operated to the NC position.

When the TUNE/OPERATE switch is in any position but OFF, +35 vdc is applied to switch S1 through TUNE/OPERATE switch deck A6S1-B1. If the output coupling link is in the minimum coupling position, switch S1 applies the +35 vdc level to switch contacts on TUNE/OPERATE

switch deck A6S1-B2 that correspond only to the OPERATE position. If the coupling link is not in this minimum position, switch S1 applies the +35 vdc level to the switch contacts on TUNE/OPERate switch deck A6S1-B2 that correspond to the TUNE-1 and TUNE-2 positions.

If the TUNE/OPERATE switch is in TUNE-1 or TUNE-2 and the output coupling link is in the minimum position (NO), the +35 vdc is not connected to the control relay circuit and thus has no affect on the proper operation of the antenna coupler. However, if the output coupling link is not in the minimum coupling position, +35 vdc is transferred to the anode of zener diode A1VR2 through the NC contact of switch S1, TUNE/OPERATE switch deck A6S1-B2, and pin 5 and diode A1CR13 on the circuit control board A1. When +35 vdc is applied to the anode of zener diode A1VR2, control relay A1K1 deenergizes and shuts down the antenna coupler.

When the TUNE/OPERATE switch is in TUNE-3 position, the output coupling link position has no effect since +35 vdc is not available at the switch contact on switch deck A6S1-B2 corresponding to the TUNE-3 position. When the TUNE/OPERATE switch is in OPERATE, +35 vdc is applied from switch S1 (NO) to zener diode A1VR2 to deenergize the circuit control relay A1K1 only if the coupling link remains in the minimum coupling position. This also shuts down the antenna coupler in the same manner as above.

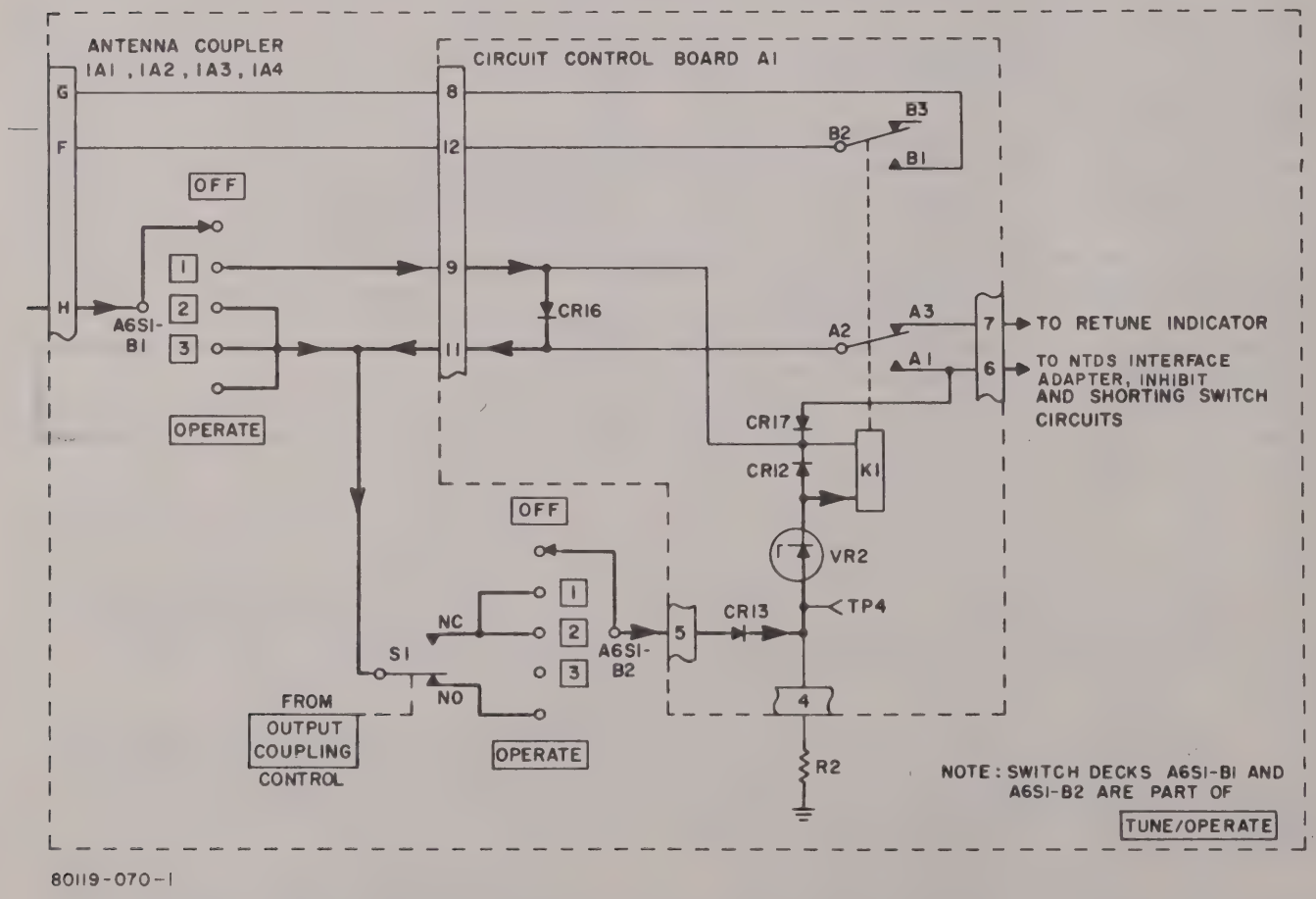


Figure 4-15. Coupling Control Circuit, Simplified Schematic Diagram

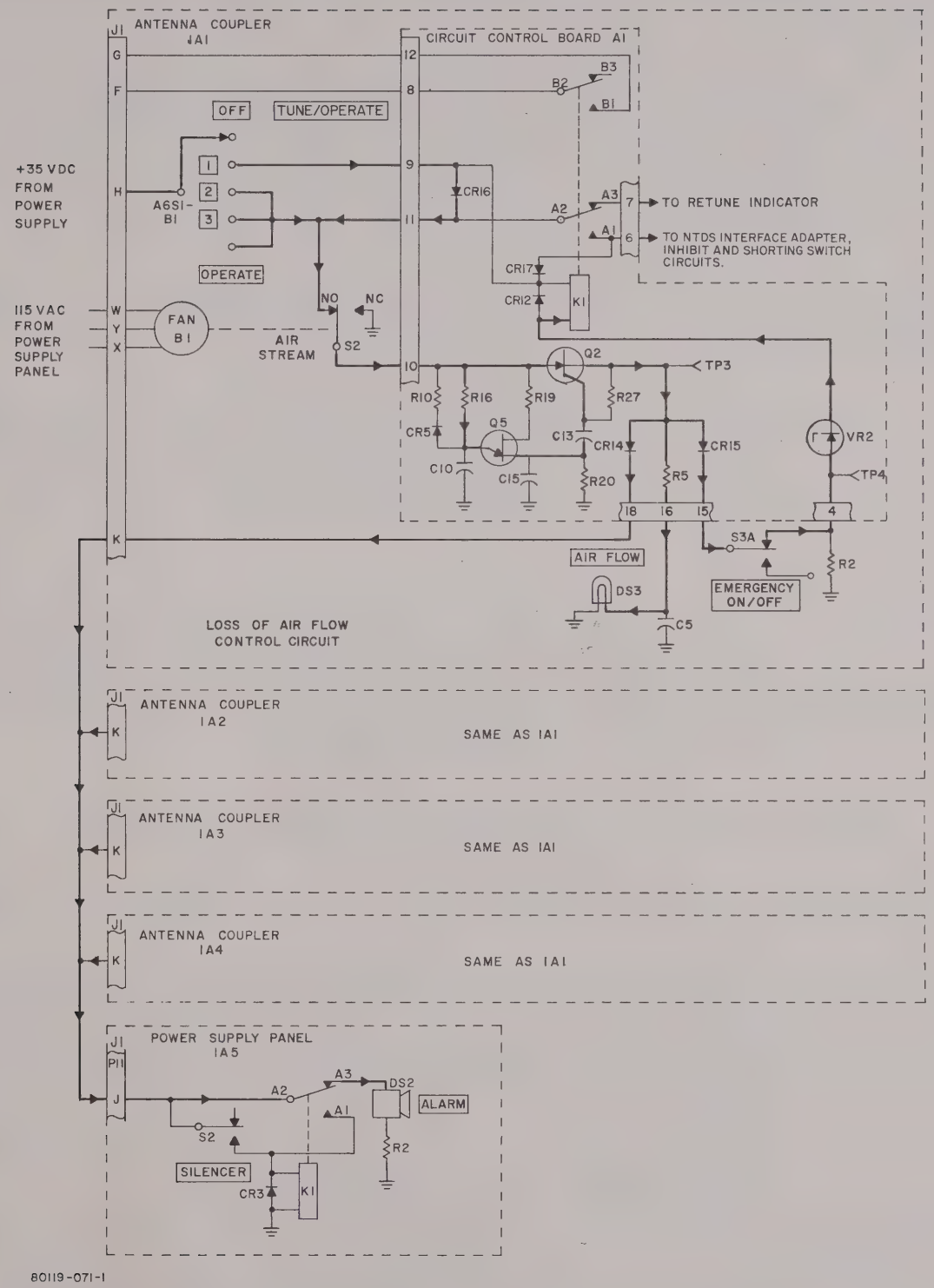


Figure 4-16 Loss-of-Air-Flow Control Circuit, Simplified Schematic Diagram

(through diode A1CR14 and pin 18), AIR FLOW indicator (through resistor A1R5 and pin 16), and circuit control relay (through diode A1CR15, pin 15, EMERGENCY switch S3A, and pin 4 of the circuit control board).

The audible alarm circuit feeds the +35 vdc voltage through a common bus connected to all antenna couplers through pin K of the antenna coupler receptacle J1 to the audible ALARM circuit on the power supply panel in the base of the cabinet. The +35 vdc level appears at pin J of power supply receptacle J11 and is transferred to the sonic ALARM DS2 through relay 1A5K1 contacts A2-A3 and resistor 1A5R2 to ground. The sonic alarm can be silenced by pressing the SILENCER switch 1A5S2 which applies +35 vdc to relay 1A5K1. When the relay energizes, contacts A2-A1 close and lock the relay and contacts A2-A3 open to remove +35 vdc from the sonic alarm generator. Leads for a remote silencer are located on TB3-17 and -18.

The AIR FLOW indicator has been described under paragraph 4.3.5.3.3.3. Note, however, that capacitor C5 acts together with circuit control board resistor A1R27 to provide a path to ground for the ac components of the pulse that gates SCR A1Q2.

The +35 vdc signal appearing at EMERGENCY switch S3A from diode A1CR15 is applied across R2 to back bias zener diode A1VR2 raising the return side of control relay A1K1 to +35 vdc. This deenergizes the relay and shuts down the antenna coupler. However, operating the EMERGENCY switch S3 to ON removes the +35 vdc control signal and relay A1K1 remains energized to permit the antenna coupler to continue to operate in an emergency mode.

4.3.5.3.4.6.2 Test Data

The procedure for isolating a fault to the loss-of-air-flow control circuit consists of a logical choice based on observations of the status indicators, fan, AIR FLOW indicator, ALARM sonic generator, and transmitter during normal operation or during preventive maintenance checks (see paragraph 5.2). The process of isolating the fault to a particular component consists of continuity checks and testing of individual components within the circuit. Test information concerning the loss-of-air-flow control circuit is presented in table 4-13.

TABLE 4-13. TEST DATA FOR LOSS-OF-AIR-FLOW CONTROL CIRCUIT

ITEM	CHARACTERISTICS	REMARKS
TEST POINTS		
H - J1-H/T	+35 vdc application point	Connect + lead to J1-H
K - J1-K/T	Alarm circuit output	Connect + lead to J1-K
S - A1TP3	Loss-of-air-flow circuit output	Connect + lead to TP3, - lead to chassis ground
T - A1TP4	Relay operation	Connect + lead to TP4, - lead to chassis ground
TEST EQUIPMENT		
Power Supply	+35 vdc, 0.4 amperes	Use coupler group power supply if available

Either of these two conditions can be bypassed by operating the EMERGENCY switch S3 to ON which removes the +35 vdc from zener diode A1VR2. This permits the control relay A1K1 to remain energized and permits the antenna coupler to be operated in an emergency mode.

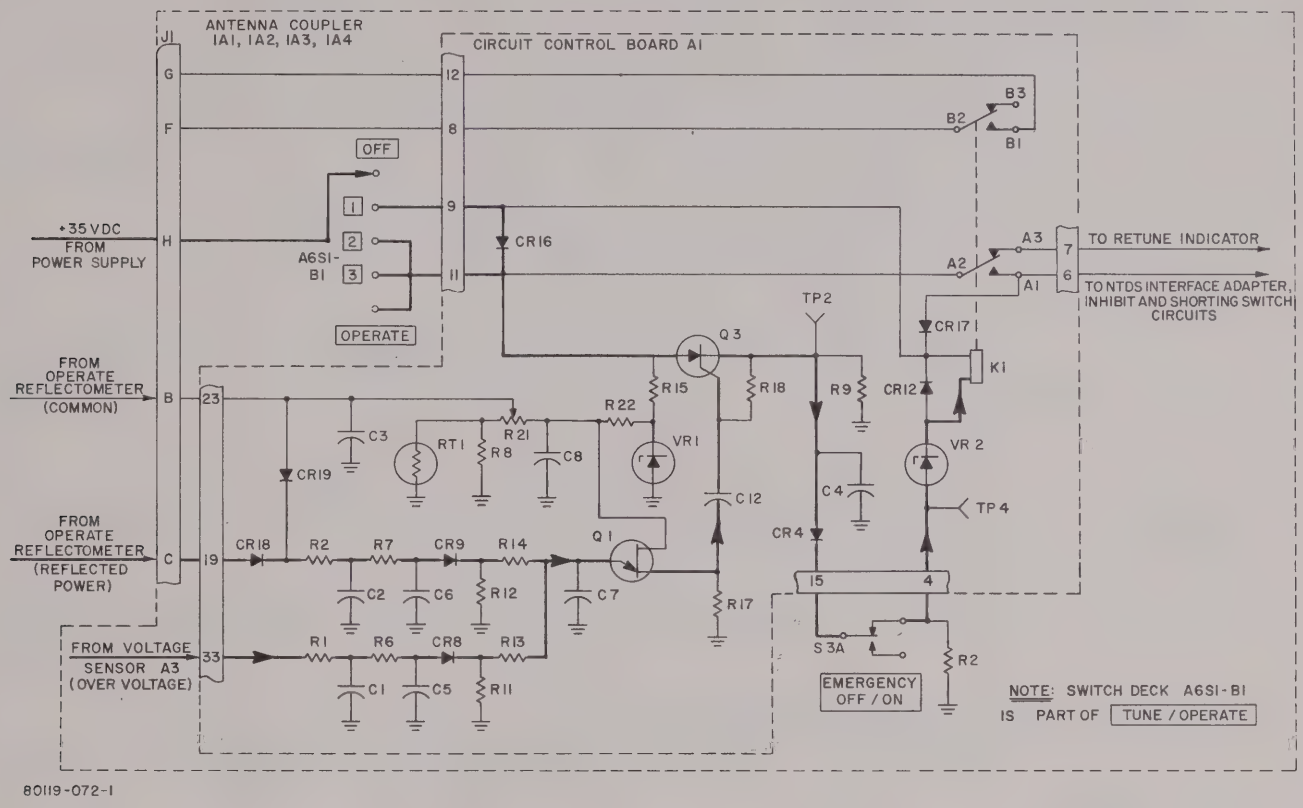


Figure 4-17. Excessive VSWR and Overvoltage Protective Circuits, Simplified Schematic Diagram

4.3.5.3.4.7.2 Test Data

The procedure for isolating a fault to the excessive vswr or overvoltage circuits consists of a logical choice based on observations of the RF POWER FORWARD and RF POWER REFLECTED meters, status indicators, and transmitter performance during normal operation or during preventive maintenance checks (see paragraph 5.2). The process of isolating the fault to a particular circuit and component consists of continuity checks and testing of the individual circuits. Test information concerning the excessive vswr and overvoltage circuits is presented in table 4-14.

TABLE 4-14. TEST DATA FOR EXCESSIVE VSWR AND OVERVOLTAGE PROTECTIVE CIRCUITS

ITEM	CHARACTERISTICS	REMARKS
OPERATIONAL CHARACTERISTICS		
Excessive VSWR Circuit Bias	0 to 1.335 vdc measured between J1-B/C	Connect + lead to J1-B

TABLE 4-14. TEST DATA FOR EXCESSIVE VSWR AND OVERVOLTAGE PROTECTIVE CIRCUITS (Continued)

ITEM	CHARACTERISTICS	REMARKS
OPERATIONAL CHARACTERISTICS (Continued)		
Trip Voltage	1.335 vdc applied between J1-B/C	Connect + lead to J1-B
Overvoltage Trip Voltage	15 vdc applied between XA1-33/gnd	Connect + lead to XA1-33
TEST POINTS		
F - J1-C/B	Trip voltage for excessive vswr	Connect + lead to J1-C
H - J1-H/T	+35 vdc application point	Connect + lead to J1-H
L - J1-B/T	Bias voltage measurement	Connect + lead to J1-B
R - A1TP2	Output of protective circuits	Connect + lead to TP2, - lead to chassis ground
T - A1TP4	Relay operation	Connect + lead to TP4, - lead to chassis ground
Y- XA1-33/gnd	Trip voltage for over-voltage	Connect + lead to XA1-33
TEST EQUIPMENT		
Power Supply	+35 vdc	Use coupler group power supply if available
Control System Cable and Test Set (Special)	See paragraph 5.2.1.2.1	See paragraphs 5.2.1.5.4.4 and 5.2.1.5.4.6
Multimeter	AN/PSM-4 ( )	Used for continuity checks and component testing
PERFORMANCE INDICATORS		
Status Indicators	NORMAL	Normal operation as specified in Section 3
EMERGENCY	OFF	
CRITICAL ADJUSTMENTS		
Bias Adjustment	A1R21	Sets bias to fire unijunction A1Q1 See paragraph 5.2.1.5.4.4

4.3.9 NTDS Interface

Additional to equipment contained in the standard antenna coupler cabinet, a special and developmental chassis has been added to provide electrical interface to the NTDS equipment. This NTDS interface unit contains four identical printed circuit component boards, one for each antenna coupler.

4.3.9.1 Functional Description

The NTDS interface consists of a chassis upon which are mounted four barrier strips for termination of NTDS cables and the ground required from barrier strips within the antenna coupler cabinet.

Since circuit boards are identical, and all active components are mounted on the circuit boards, all boards are interchangeable within other antenna coupler channels in the group.

Circuitry within the interface converts control and monitor signals from NTDS and the four antenna couplers to meet revised system requirements. All signals are dc, originate in both NTDS equipment and antenna couplers, and carry logical potentials of either +35 vdc or ground.

4.3.9.2 Circuit Description

In order that the NTDS configuration can be accomplished, several minor modifications have been made to the equipment cabinet. Schematically, figures 4-3, 4-11, 4-13, 5-48A and 5-52 show the equipment in its modified configuration. Figure 5-52 is a revised antenna coupler schematic for the antenna coupler drawers, replacing figure 5-51 in the original manual for purposes of the NTDS configuration.

As indicated, all wiring to NTDS equipment terminates at terminal boards 1A6A8TB1, 1A6A8TB2, 1A6A8TB3 and 1A6A8TB4. Signal names, pin numbers and functions are identical for each of the 4 channels, and are described in table 4-18.

TABLE 4-18. INTERFACE TO NTDS SIGNAL FUNCTIONS

SIGNAL NAME	FUNCTION
ALARM	NTDS primary safety interlock. ALARM line is normally grounded through coupler drawer interlock switch 1A6S1. If the drawer is open, switch 1A6S1 is deactivated, the circuit is placed in an open condition, thus, positively inhibiting the transmitter.
TUNE ACTIVATE	NTDS system momentarily grounds this line to indicate that coupler retuning is required.
OPERATE	NTDS system grounds this line to indicate that the particular antenna coupler has been selected. NTDS may momentarily break ground return to indicate that coupler retuning is required.
CARRIER INSERT	Antenna coupler places a ground on this line to command tune power from transmitter for coupler tuning.

TABLE 4-18. INTERFACE TO NTDS SIGNAL FUNCTIONS (Continued)

SIGNAL	FUNCTION
TUNE COMPLETE	Antenna coupler grounds this line when coupler tuning is complete to enable full power from transmitter to enter the coupler.
GROUND	Always at ground potential, this line is equivalent to the antenna coupler group chassis ground system.

Interconnections between the interface adapter unit and the antenna coupler group are described in table 14-19.

TABLE 4-19. INTERFACE TO ANTENNA COUPLER GROUP SIGNAL FUNCTIONS

SIGNAL	FUNCTION
DRAWER INTERLOCK	Identical to ALARM, see table 2.
+35 VDC VIA CONTROL RELAY	Indicates that coupler is in the normal condition and provides operating power for the interface adapter. This signal is not present when the coupler is in the RETUNE or OFF modes.
INHIBIT	Interface adapter applies +35 vdc to this line to deenergize coupler control relay and place coupler in RETUNE mode.
+35 VDC IN TUNE	Indicates that coupler is in TUNE-1, -2, or -3. When +35 vdc VIA CONTROL RELAY present and +35 vdc IN TUNE absent, indicates coupler is in OPERATE. This signal derived from coupler via plug 1A6A8P1.
POWER ATTENUATOR INSERT	+35 vdc applied to this line by the interface adapter activates relay pair in 1A6A7, inserting power attenuator. This signal supplied to coupler via plug 1A6A8P1.

Operation of the interface adapter is as follows (refer to figure 5-48A): When the antenna coupler is switched from OFF to TUNE-1, the coupler control relay is energized and latched, causing +35 VDC VIA CONTROL RELAY to appear at P1 pin 7. This is the supply voltage for the interface adapter. This voltage applied through K1A2 and K1A3, causes the rf relay assembly in the coupler to direct the rf signal through the power attenuator. Since the coupler is in TUNE, +35 VDC IN TUNE will be applied to energize relay K2 via P1, pin 8. When relay K2 is energized, the CARRIER INSERT line (P1, pin 15) is connected via K2B1 and K1B3 to the OPERATE line (P1, pin 6). If the coupler has been selected for operation, the NTDS system provides a ground return on the OPERATE line. The resultant ground applied to the CARRIER INSERT line then commands TUNE POWER from the transmitter. The above conditions are maintained for antenna coupler functions TUNE-2, and TUNE-3 since the antenna coupler control relay remains latched.

As antenna coupler tuning is completed and the TUNE/OPERATE switch is moved to OPERATE, the +35 VDC IN TUNE is removed from P1, pin 8. Relay K2 drops out, disconnecting the CARRIER INSERT line at K2B1. When relay K2 drops out, +35 VDC VIA CONTROL RELAY (P1, pin 7) is applied via K2A3 to the time delay circuit consisting of Q1, R5, C1 and CR10. When voltage is first applied to the anode of Q1, its cathode and gate are at ground potential. The potential rises across C1, which is being charged through R5. When the Zener voltage of CR10 is reached, it conducts, triggering Q1 after approximately 1.5 seconds. Once triggered, Q1 will conduct until its anode voltage is removed. C1 will then discharge through R5. The purpose of R4 and C2 is to suppress transients, which could falsely trigger Q1.

Upon time delay completion, relay K1 energizes, removing voltage from the POWER ATTENUATOR INSERT line (K1A3). Thus, the CARRIER INSERT signal is removed approximately 1.5 seconds before the POWER ATTENUATOR is switched out of the RF circuit.

When relay K1 closes, the TUNE COMPLETE (P1, pin 14) line is connected via K1B1 and K2B3 to the OPERATE line (P1, pin 6). If the coupler has been selected for operation, the NTDS system provides a ground return on the OPERATE line. The resultant ground applied to the TUNE COMPLETE line then enables operate power from the transmitter. Closure of K1 also applies +35 volts via K1A1 to latch K1, as well as to K3A2.

If relay K3 is not energized, +35 volts is applied via K3A3 and CR2 to the INHIBIT line (P1, pin 4), causing antenna coupler control relay to drop out and remove all power from the NTDS interface adapter unit. K3 will be energized in normal operation when the NTDS system provides a ground on the OPERATE line (P1, pin 6) and the antenna coupler provides +35 vdc VIA CONTROL RELAY (P1, pin 7).

Should antenna coupler retuning be required, the NTDS system generates a RETUNE command by either momentarily grounding the TUNE ACTIVATE line (P1, pin 5) or dropping the ground on the OPERATE line. Either of these actions causes relay K3 to drop out long enough to apply an INHIBIT signal at P1, pin 4.

When the interface adapter is in the operate condition (K1 energized), and INHIBIT is also generated if the antenna coupler function switch is moved from OPERATE back to TUNE-3. K1 remains latched for the moment through K1A1. The +35 VDC IN TUNE SIGNAL causes K2 to energize, isolating the TUNE COMPLETE line at K1B1 from the OPERATE line. When K2 is fully energized, +35 VDC VIA CONTROL RELAY is applied to the INHIBIT line via K1A1, CR8, K2A1, and CR5.

Note

While both K1 and K2 are energized, the CARRIER INSERT and TUNE COMPLETE lines are connected together via K1B1 and K2B1. Steering diodes CR3 and CR6 (see note 2, figure 5-48A) prevent interaction between these two lines for the SRC-16 NTDS system. The SRC-23 NTDS system contains circuitry to prevent such interaction, thus CR3 and CR6 should be left jumpered out.

An INHIBIT signal generated within either the interface adapter as discussed above or within the antenna coupler due to mistuning or a coupler fault will unkey the transmitter. An INHIBIT causes the coupler control relay to drop out, removing +35 VDC VIA CONTROL RELAY (P1, pin 7). This action will cause all energized relays in the interface adapter to drop out, positively disconnecting both CARRIER INSERT and TUNE COMPLETE lines.

The INHIBIT from the interface adapter (P1 pin 4) may be defeated for emergency operation or testing by placing the antenna coupler EMERGENCY switch in the ON position.

4.3.9.3 Test Data

The procedure for isolating a fault to the NTDS interface circuits consists of logical choice based on observations of the status indicators on all antenna couplers and all transmitters during normal operation or during preventive maintenance checks (see Paragraph 5.2). The process of isolating the fault to a particular component consists of testing of individual components and continuity checks. Test information concerning the NTDS interface unit is presented in Table 4-20.

TABLE 4-20. TEST DATA FOR NTDS INTERFACE UNIT

ITEM	CHARACTERISTICS	REMARKS
TEST POINTS		
1A6A8TB1, 2, 3 and 4	All NTDS signals available	See Figure 5-48A
TEST EQUIPMENT		
Power Supply	+35 vdc, 0.4 amperes	Coupler group power supply if available.
Multimeter	AN/PSM-4 ( )	Use for checking continuity and component testing.
PERFORMANCE INDICATORS		
Status Indicators	NORMAL, RETUNE	Refer to Section 3 and Paragraph 4.3.9.2
Transmitter		
Transmitter Adapter	ALARM, TUNE, OPERATE	Check indicators on transmitter adapter and multicoupler adapter units for identical indications.
Multicoupler Adapter	ALARM, TUNE, OPERATE	
CRITICAL ADJUSTMENTS		
None		
REFERENCE DATA		
NTDS Interface Schematic Diagram		See Figure 5-48A
Modified Power Attenuator Schematic Diagram		See Figure 4-3
Control Relay, Simplified Schematic Diagram		See Figure 4-11

TABLE 4-20. TEST DATA FOR NTDS INTERFACE UNIT (Continued)

ITEM	CHARACTERISTICS	REMARKS
REFERENCE DATA (Continued)		
Tune Indication and Inhibit, Simplified Schematic Diagram		See Figure 4-14
NTDS Compatible Antenna Couplers CU-1772/SRA-56, CU-1774/SRA-57, and CU-1776/SRA-58, Schematic Diagram		See Figure 5-51
Parts Location		See Figures 5-45A through 5-45D

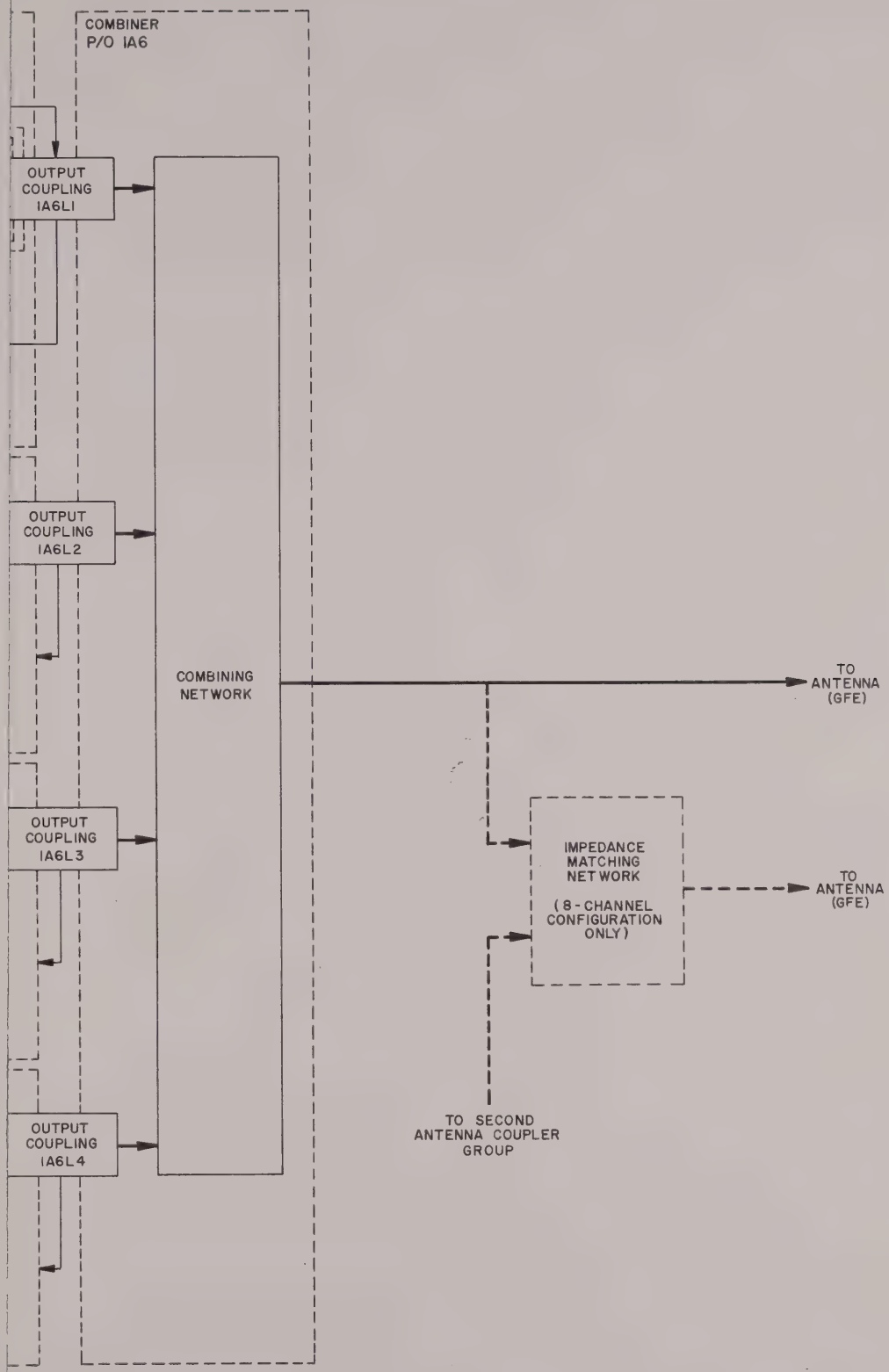


Figure 4-21 Antenna Coupler Group AN/SRA-56 AN/SRA-57, or AN/SRA-58, Overall Functional Block Diagram

NAVSHIPS 0967-284-6011

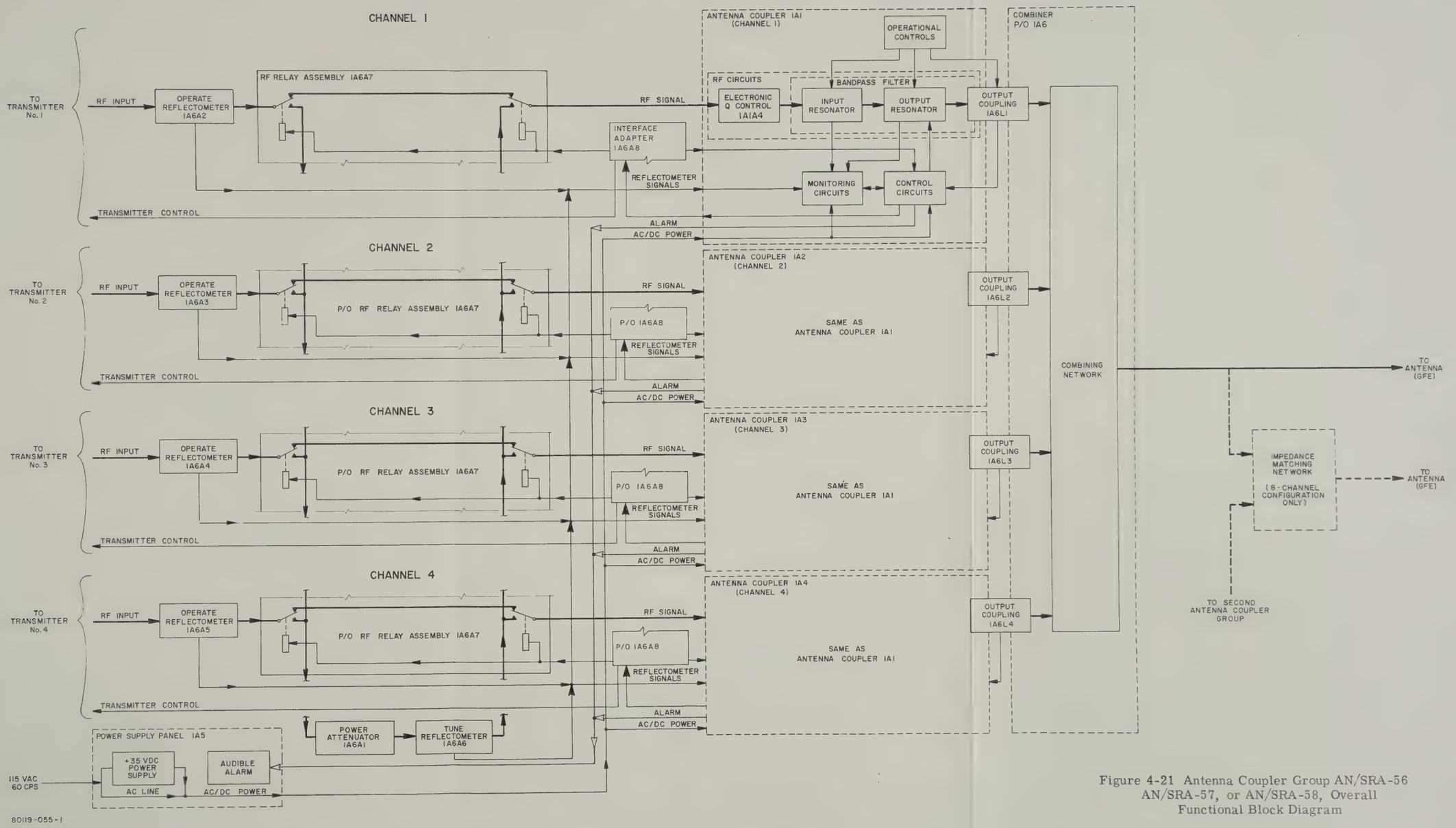


Figure 4-21 Antenna Coupler Group AN/SRA-56 AN/SRA-57, or AN/SRA-58, Overall Functional Block Diagram

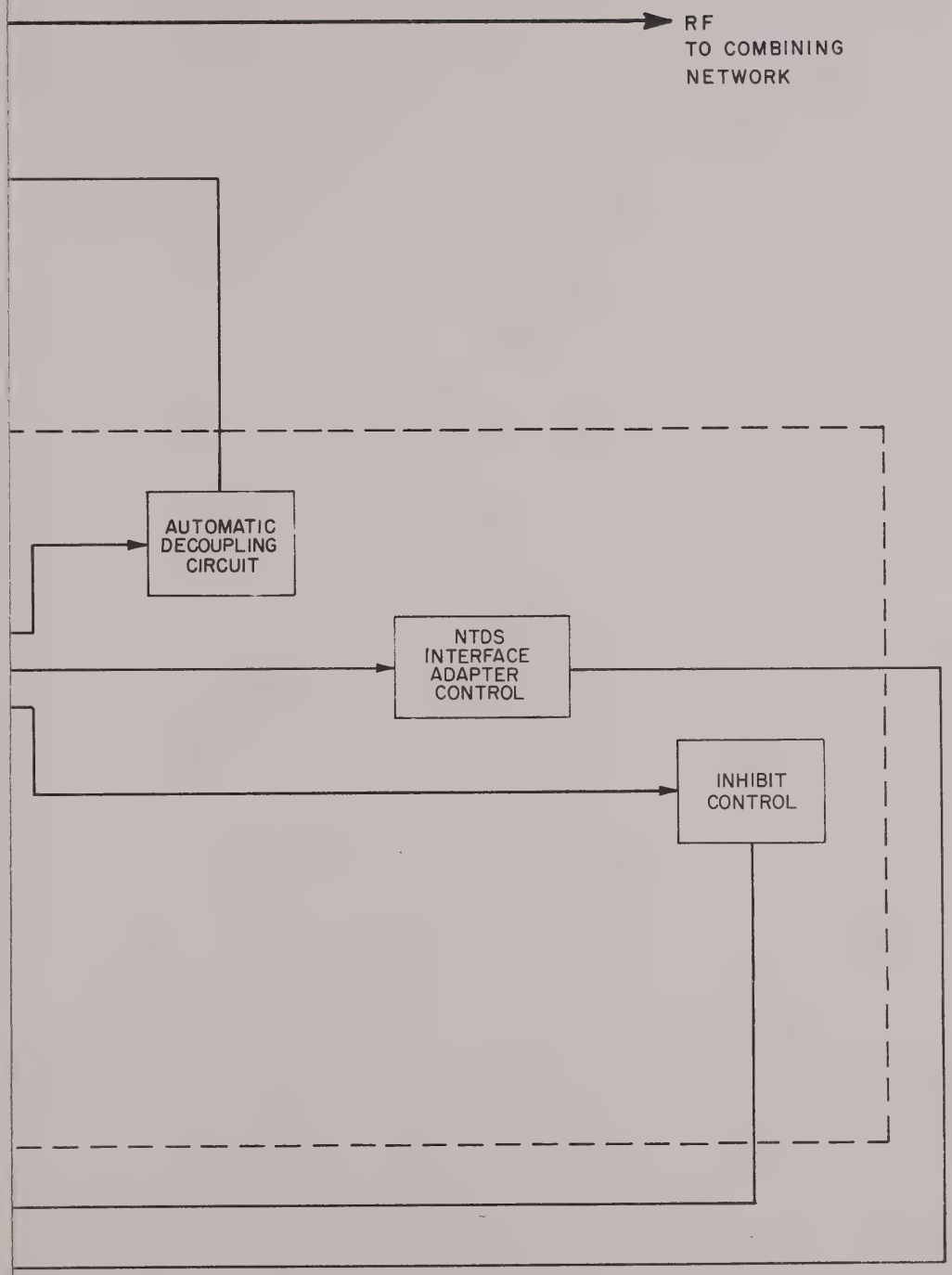


Figure 4-22 Antenna Coupler CU-1772/SRA-56, CU-1774/SRA-57, or CU-1776/SRA-58, Functional Block Diagram

NAVSHIPS 0967-284-6011

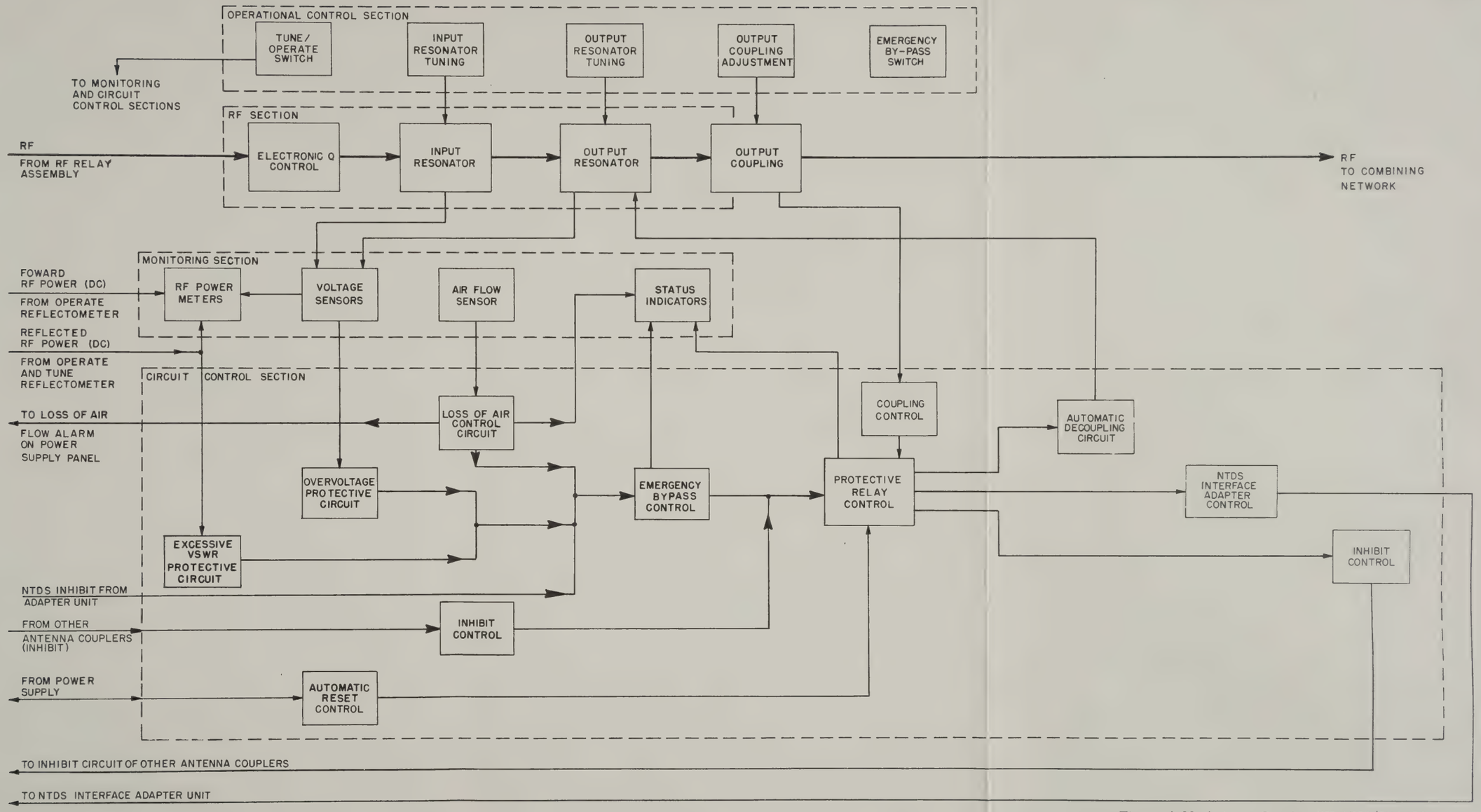


Figure 4-22 Antenna Coupler CU-1772/SRA-56, CU-1774/SRA-57, or CU-1776/SRA-58, Functional Block Diagram

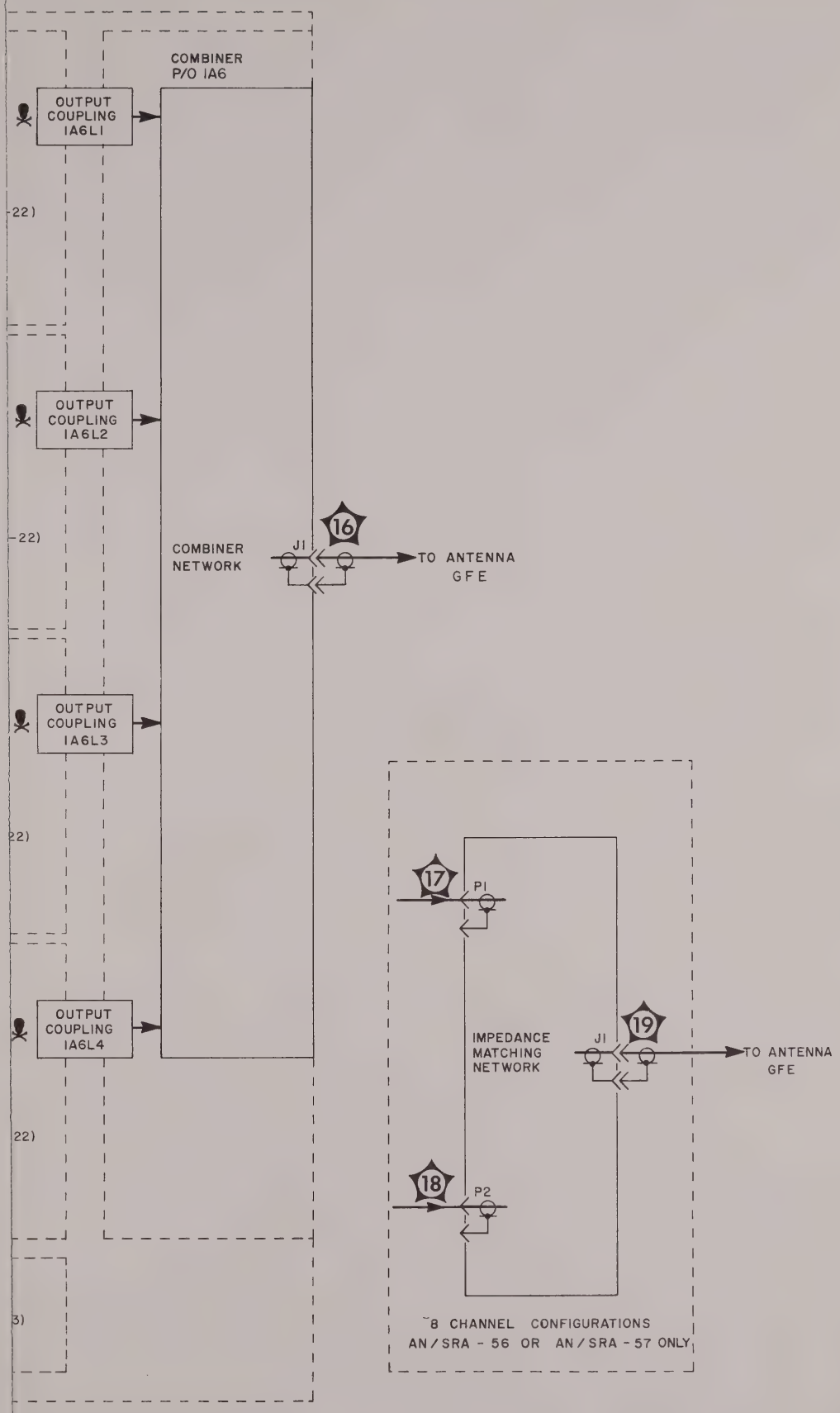


Figure 4-23 Antenna Coupler Group AN/SRA-56, AN/SRA-57, or AN/SRA-58 Servicing Block Diagram

NAVSHIPS 0967-284-6011

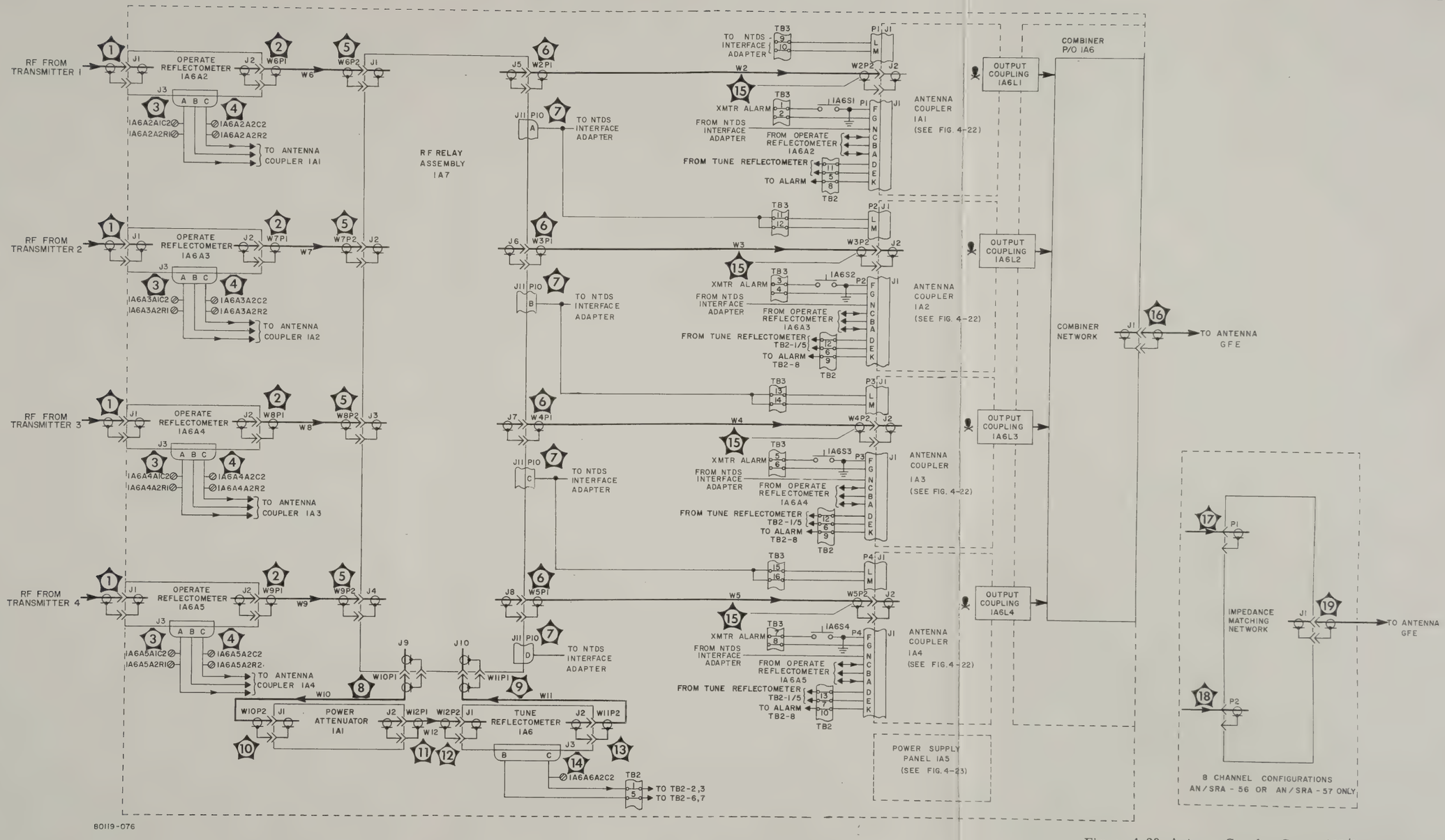


Figure 4-23 Antenna Coupler Group AN/SRA-56, AN/SRA-57, or AN/SRA-58 Servicing Block Diagram

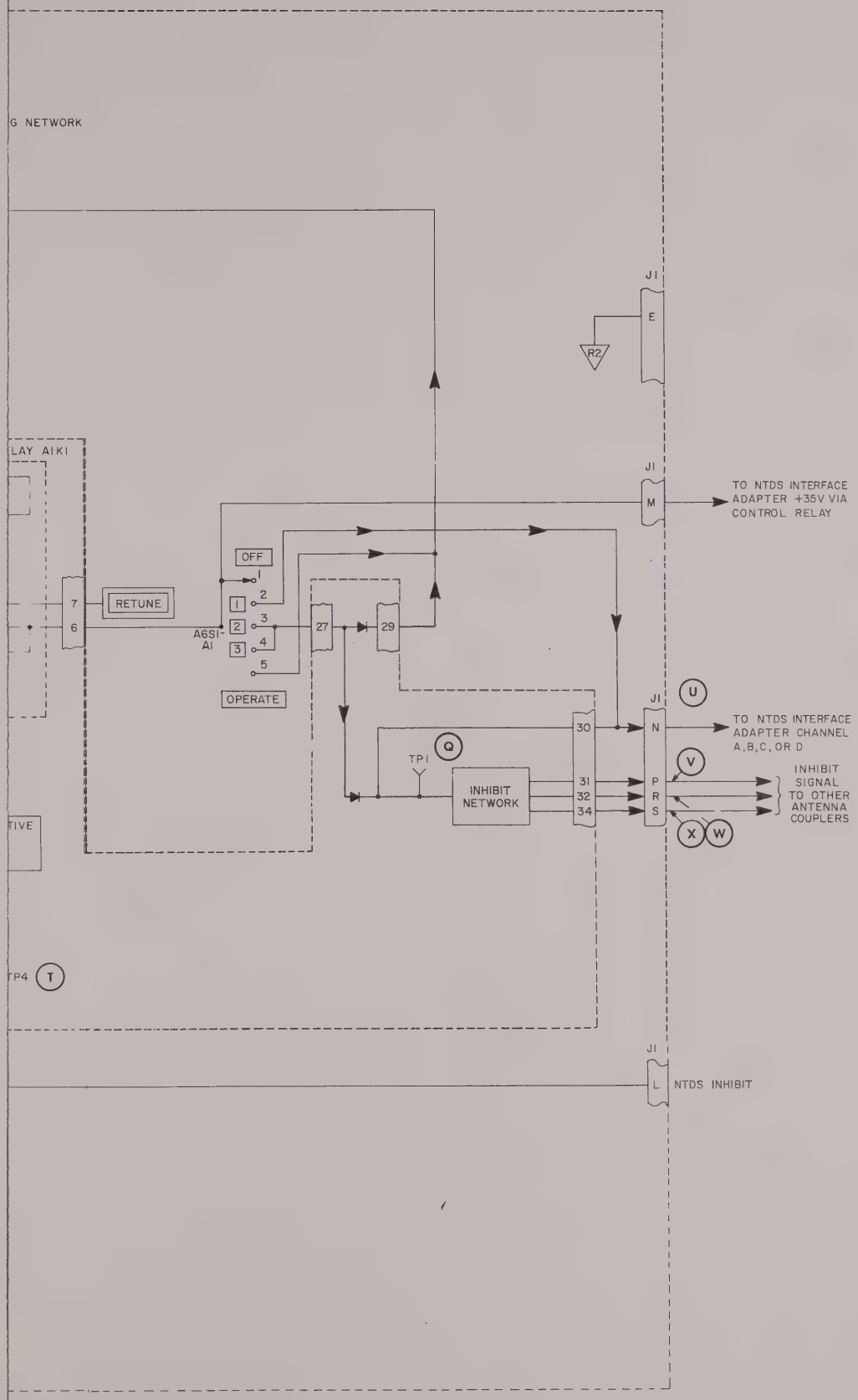


Figure 4-24 Antenna Coupler CU-1772/SRA-56, CU-1774/SRA-57, or CU-1776/SRA-58, Servicing Block Diagram

NAVSHIPS 0967-284-6011

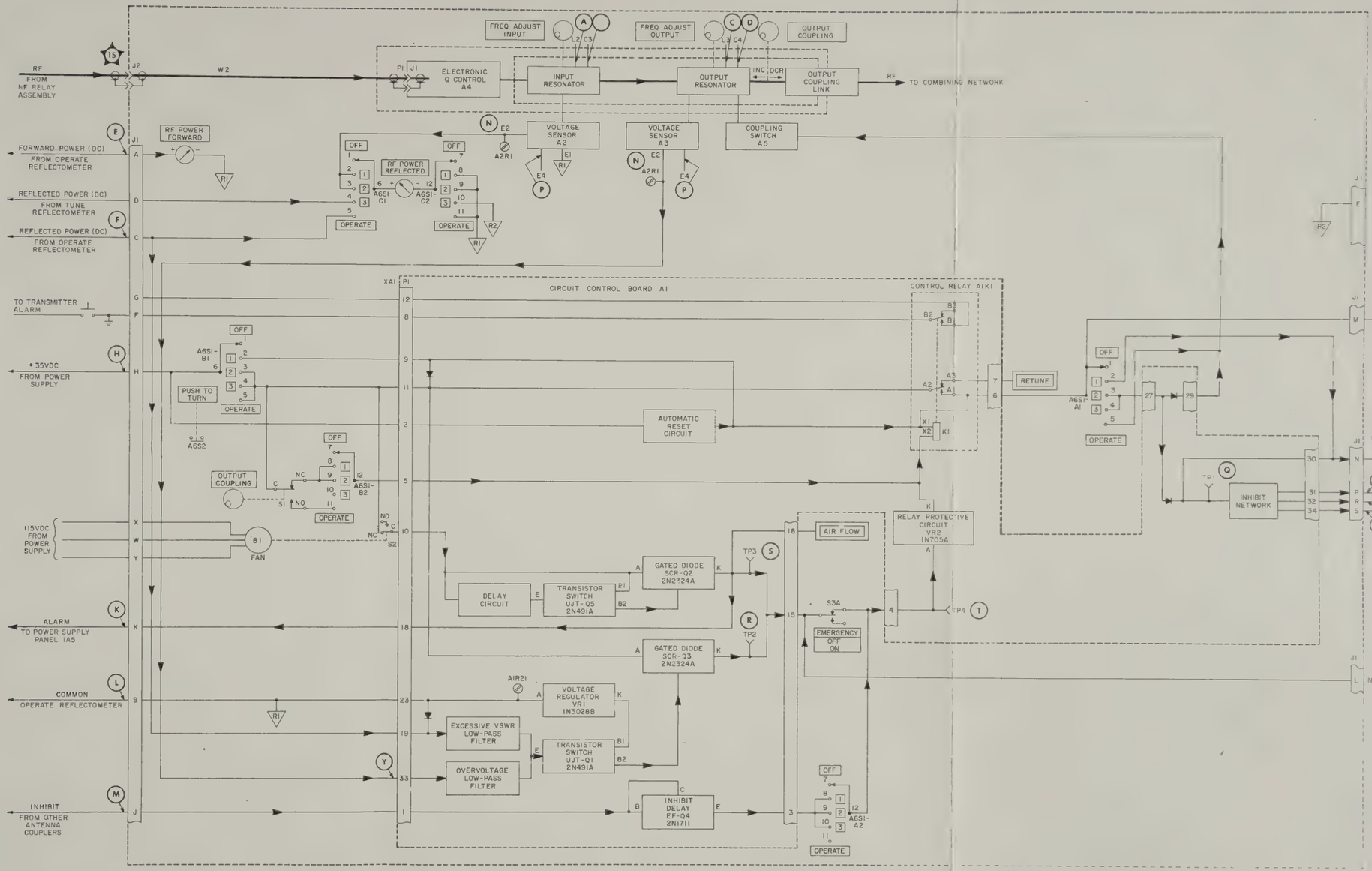


Figure 4-24 Antenna Coupler CU-1772/SRA-56, CU-1774/SRA-57, or CU-1776/SRA-58, Servicing Block Diagram

coupler group under the worst case, 3-to-1 vswr load condition.

5.2.1.2.1 Control System Cable and Test Set

The control system cable and test set is used in the calibration of the control circuits in each antenna coupler. The same cable and test set is used for all antenna couplers in all three coupler groups. A schematic diagram and fabrication details of the control system cable and test set are given in figure 5-1. The calibration procedures it is used with are given in paragraph 5.2.1.5.4.

5.2.1.2.2 Special RF Cables

Special rf cables for each coupler group are used in the measurement of antenna coupler performance under worst case, 3-to-1 vswr load condition. One standard cable, 20 feet in length, is used to establish a reference or control point on the 3-to-1 vswr circle at the worst case frequency, while the second cable is used to present the worst case matching condition to the antenna coupler for the 3-to-1 vswr load. Two special cables are required for each coupler group; an additional special cable is required for 8 channel configurations of Antenna Coupler Group AN/SRA-57. Schematic diagrams and fabrication details for these cables are shown in figure 5-2. The procedures with which they are used are presented in paragraph 5.2.1.5.3.

5.2.1.3 Special Procedures

In the procedures that follow, the entire coupler group should be secured in accordance with paragraph 3.3.2.5 of section 3. However, when maintenance cannot be scheduled to permit all channels to be secured because of operational requirements, it is possible to perform some of the inspections, checks, and measurement procedures that involve only one antenna coupler at a time. Traffic can then be shifted to a channel that has been checked, and the procedures repeated for other channels in the coupler group.

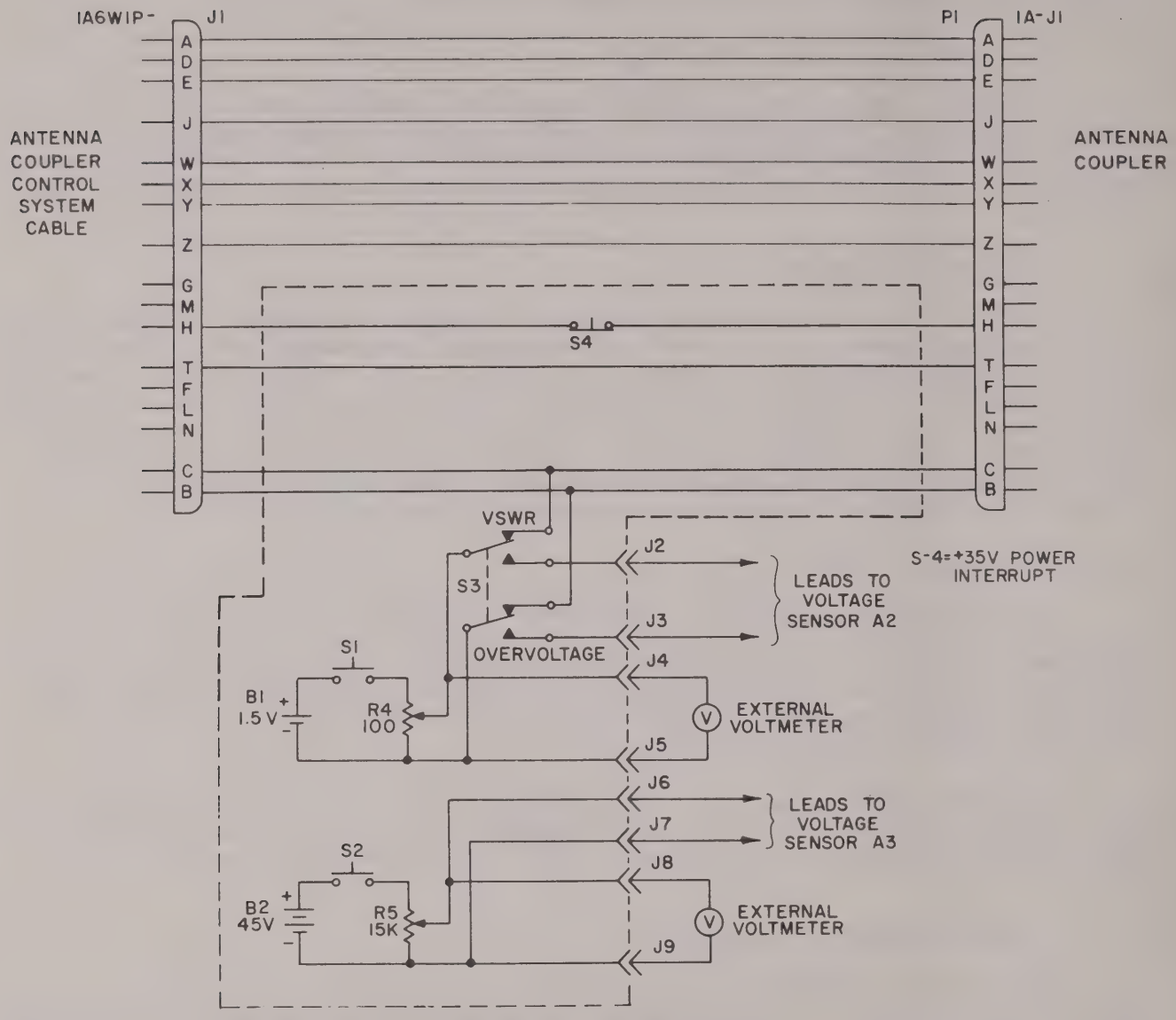
The entire coupler group must be secured for the inhibit control circuit check (paragraph 5.2.1.5.1.3); worst case, 3-to-1 vswr load (paragraph 5.2.1.5.3), relative and detailed insertion loss measurements (paragraphs 5.2.1.5.2 and 5.2.1.5.5), and isolation measurements (paragraph 5.2.1.5.6).

5.2.1.4 Reference Standards Procedures

The reference standards procedures for Antenna Coupler Groups AN/SRA-56, -57, and -58 are presented in table 5-2. These procedures must be performed in accordance with instructions given in paragraph 5.2.1.5. The following paragraphs will aid in interpreting the data obtained for the reference standards procedures.

Although the antenna couplers are completely interchangeable and can occupy any position in the equipment cabinet, the OUTPUT COUPLING indicator characteristics of an individual antenna coupler are dependent upon the position in which the antenna coupler is installed. For repeatability of the OUTPUT COUPLING number, it is important to maintain a daily record of the particular antenna coupler installed in a particular position of the cabinet. Changes in the OUTPUT COUPLING number can be expected when a drawer is placed in a position other than that in which previous data was taken. When an antenna coupler position is changed, the previous data on that antenna coupler is invalid, and a new history from which to interpret the data must be compiled.

Record OUTPUT COUPLING number information that lends itself to interpretation meaningfully. The more entries related to the same frequency on continuing days that are made, the more valuable the recorded data becomes in showing trends that will disclose deterioration of



ITEM	SPECIFICATION	PART NUMBER
S1, S2	MIL-S-8805/3B	MS25089-1E
S3	MIL-S-8805/24B	MS8805/24-001
S4	MIL-S-8805/3B	MS25089-2E
B1	MIL-B-18/9A	DRY BATTERY BA-23
B2	MIL-B-18/14A	DRY BATTERY BA-36
	MIL-L-3661/5	LH73LC11RN
R4	MIL-R-94C	RV6NAYSD101A
R5	MIL-R-94C	RV6NAYSD153A
J2, J4, J6, J8	MIL-P-55149	PB01FA01
J3, J5, J7, J9	MIL-P-55149	PB01FA02

80481-006

Figure 5-1. NTDS Compatible Control System Cable and Test Set

are followed in the required order. The automatic reset check ensures that the antenna coupler will reset to its correct status when power is restored after a primary power failure. Refer to paragraphs 4.3.5.3.4.5 and 4.3.5.3.4.2 for descriptions and simplified schematic diagrams.

Step 1. On antenna coupler 1A1, ensure that OUTPUT COUPLING control is in the maximum DECREASE direction to the stop. Operate the EMERGENCY ON/OFF switch to ON.

Step 2. Rotate TUNE/OPERATE switch to TUNE-1. NORMAL indicator must light.

Step 3. Rotate OUTPUT COUPLING control two revolutions in the INCREASE direction. RETUNE indicator must light and NORMAL indicator must go out.

Step 4. Rotate TUNE/OPERATE switch to TUNE-2. RETUNE indicator must remain lit.

Step 5. Rotate OUTPUT COUPLING control in the DECREASE direction to the stop. RETUNE indicator must remain lit.

Step 6. Rotate TUNE/OPERATE switch to TUNE-1. NORMAL indicator must light and RETUNE indicator must go out.

Step 7. Rotate TUNE/OPERATE switch to TUNE-2. NORMAL indicator must remain lit.

Step 8. Rotate TUNE/OPERATE switch to TUNE-3. NORMAL indicator must remain lit.

Step 9. Rotate OUTPUT COUPLING two revolutions in the INCREASE direction. NORMAL indicator must remain lit.

Step 10. Depress and rotate TUNE/OPERATE switch to OPERATE. NORMAL indicator must remain lit.

Step 11. On power supply panel 1A5, operate POWER-ON/OFF switch to OFF; NORMAL indicator on antenna coupler must go out. After 15 seconds, operate POWER ON/OFF switch to ON; NORMAL indicator must light.

Step 12. On the antenna coupler, rotate OUTPUT COUPLING control in the maximum DECREASE direction to the stop. RETUNE indicator must light and NORMAL indicator must go out.

Step 13. On the power supply panel, operate POWER-ON/OFF switch to OFF; RETUNE indicator must go out. After 15 seconds, operate POWER-ON/OFF switch to ON; RETUNE indicator must light.

Step 14. Rotate TUNE/OPERATE switch to TUNE-2. RETUNE indicator must remain lit.

Step 15. On the power supply panel, operate POWER-ON/OFF switch to OFF; RETUNE indicator must go out. After 15 seconds, operate POWER-ON/OFF switch to ON; NORMAL indicator must light.

Step 16. Rotate TUNE/OPERATE switch to OFF. Operate the EMERGENCY ON/OFF switch to OFF.

Step 17. On antenna coupler 1A2, ensure that the OUTPUT COUPLING control is in its maximum DECREASE position at the stop, and repeat steps 2 through 16 for that antenna coupler.

Step 18. On antenna coupler 1A3, ensure that the OUTPUT COUPLING control is in its maximum DECREASE position at the stop, and repeat steps 2 through 16 for that antenna coupler.

Step 19. On antenna coupler 1A4, ensure that the OUTPUT COUPLING control is in its maximum DECREASE position at the stop, and repeat steps 2 through 16.

5.2.1.5.1.3 Inhibit Circuits

The inhibit circuits check ensures that one, and only one, antenna coupler within a coupler group will have access to the power attenuator and tune reflectometer at any given time. This check involves all antenna couplers in the coupler group operating in several combinations, and is based on the minimum number of such combinations required to determine that the inhibit circuits in each antenna coupler are performing properly.

Note

The entire coupler group must be secured for these procedures. Operate the EMERGENCY-ON/OFF switch to ON for each antenna coupler.

The procedures are given in table 5-4. Perform each step separately and in the order given to minimize the time required to perform the check. The table is designed so that the TUNE/OPERATE switch on only one or two antenna couplers must be changed from step to step. Do not disturb the TUNE/OPERATE switch on any antenna coupler where it is the same from one step to the next.

In steps 10, 20, 30 and 40, rotate the OUTPUT COUPLING control on the antenna coupler under test at least two revolutions in the INCREASE direction while the TUNE/OPERATE switch is in TUNE-3 before rotating the switch to OPERATE. In steps 12, 22, 32, and 42, rotate the OUTPUT COUPLING control on the antenna coupler under test in the maximum DECREASE direction to the stop when the TUNE/OPERATE switch is rotated to the OFF position from the TUNE-3 position.

Refer to paragraph 4.3.5.3.4.4 for a description and simplified schematic diagram of the inhibit circuits.

TABLE 5-4. PROCEDURES FOR CHECKING INHIBIT CIRCUITS

	COUPLER 1A1		COUPLER 1A2		COUPLER 1A3		COUPLER 1A4	
STEP	TUNE/ OPERATE	STATUS	TUNE/ OPERATE	STATUS	TUNE/ OPERATE	STATUS	TUNE/ OPERATE	STATUS
1	OFF	Out	OFF	Out	OFF	Out	OFF	Out
2	TUNE 1	NORMAL						
3	TUNE 1	NORMAL	TUNE 1	RETUNE				
4	TUNE 1	NORMAL	OFF	Out	TUNE 1	RETUNE		
5	TUNE 1	NORMAL			OFF	Out	TUNE 1	RETUNE
6	TUNE 2	NORMAL					TUNE 1	RETUNE
7	TUNE 3	NORMAL					TUNE 1	RETUNE
8	TUNE 3	NORMAL			TUNE 1	RETUNE	OFF	Out
9	TUNE 3	NORMAL	TUNE 1	RETUNE	OFF	Out		
10	OPERATE	NORMAL	TUNE 1	NORMAL				
11	TUNE 3	RETUNE	TUNE 1	NORMAL				

TABLE 5-4. PROCEDURES FOR CHECKING INHIBIT CIRCUITS (Continued)

	COUPLER 1A1		COUPLER 1A2		COUPLER 1A3		COUPLER 1A4	
STEP	TUNE/ OPERATE	STATUS	TUNE/ OPERATE	STATUS	TUNE/ OPERATE	STATUS	TUNE/ OPERATE	STATUS
12	OFF	Out	TUNE 1	NORMAL				
13	TUNE 1	RETUNE	TUNE 1	NORMAL				
14	OFF	Out	TUNE 1	NORMAL	TUNE 1	RETUNE		
15			TUNE 1	NORMAL	OFF	Out	TUNE 1	RETUNE
16			TUNE 2	NORMAL			TUNE 1	RETUNE
17			TUNE 3	NORMAL			TUNE 1	RETUNE
18			TUNE 3	NORMAL	TUNE 1	RETUNE	OFF	Out
19	TUNE 1	RETUNE	TUNE 3	NORMAL	OFF	Out		
20	OFF	Out	OPERATE	NORMAL	TUNE 1	NORMAL		
21			TUNE 3	RETUNE	TUNE 1	NORMAL		
22			OFF	Out	TUNE 1	NORMAL		
23	TUNE 1	RETUNE			TUNE 1	NORMAL		
24	OFF	Out	TUNE 1	RETUNE	TUNE 1	NORMAL		
25			OFF	Out	TUNE 1	NORMAL	TUNE 1	RETUNE
26					TUNE 2	NORMAL	TUNE 1	RETUNE
27					TUNE 3	NORMAL	TUNE 1	RETUNE
28			TUNE 1	RETUNE	TUNE 3	NORMAL	OFF	Out
29	TUNE 1	RETUNE	OFF	Out	TUNE 3	NORMAL		
30	OFF	Out			OPERATE	NORMAL	TUNE 1	NORMAL
31					TUNE 3	RETUNE	TUNE 1	NORMAL
32					OFF	Out	TUNE 1	NORMAL
33	TUNE 1	RETUNE					TUNE 1	NORMAL
34	OFF	Out	TUNE 1	RETUNE			TUNE 1	NORMAL
35			OFF	Out	TUNE 1	RETUNE	TUNE 1	NORMAL
36					TUNE 1	RETUNE	TUNE 2	NORMAL
37					TUNE 1	RETUNE	TUNE 3	NORMAL
38			TUNE 1	RETUNE	OFF	Out	TUNE 3	NORMAL
39	TUNE 1	RETUNE	OFF	Out			TUNE 3	NORMAL
40	TUNE 1	NORMAL					OPERATE	NORMAL
41	TUNE 1	NORMAL					TUNE 3	RETUNE
42	OFF	Out	OFF	Out	OFF	Out	OFF	Out

Operate the EMERGENCY-ON/OFF switch to OFF.

5.2.1.5.1.4 Transmitter Keylines, Transmitter Alarm Lines and Drawer Interlock Circuits

The transmitter keylines circuit check ensures that the transmitter will produce either tune or operate power at the proper times, that transmitter rf will be removed from the rf relay assembly when the antenna coupler switches from tune to operate modes, and that transmitter rf is shut down when coupler is in the retune condition. The transmitter alarm line and drawer interlock circuit check ensures that transmitter will positively shut down if the associated antenna coupler drawer is not in the fully closed position. Refer to paragraph 4.3.9.2 for a description and simplified schematic diagram of these circuits.

CAUTION

Do not perform these procedures as part of the installation checkout until the control system has been calibrated in accordance with paragraph 5.2.1.5.4. During installation, rf power must not be applied to the coupler group until all control circuits have been properly checked and calibrated. Be sure that multicoupler output is connected to either its antenna or a suitable dummy load.

Step 1. Connect a transmitter to antenna coupler 1A1 using the NTDS matrix. Tune transmitter in normal manner using transmitter PA TUNE mode.

Step 2. Switch transmitter PLATE SUPPLY to OFF. Switch transmitter to COUPLER TUNE mode.

Step 3. If NTDS system does not use a coupler adapter, proceed to Step 11.

Step 4. If NTDS system uses a coupler adapter, switch adapter to LOCAL mode. If STANDBY lamp lights, reset transmitter by switching to PA TUNE and back to COUPLER TUNE. Switch coupler adapter to STANDBY. Adapter and transmitter ALARM lamps should be out, and coupler NORMAL lamp should light.

Step 5. Switch coupler adapter to TUNE. Coupler adapter and transmitter TUNE lamps should light.

Step 6. Switch coupler adapter to OPERATE. Adapter and transmitter OPERATE lamps should light.

Step 7. Switch coupler adapter to ALARM. Adapter and transmitter ALARM lamps should light.

Step 8. Switch coupler adapter ALARM off. Adapter and transmitter STANDBY lamps should remain lighted.

Step 9. Switch coupler adapter to STANDBY. Reset transmitter by switching to PA TUNE and back to COUPLER TUNE. STANDBY lamps should go out.

Step 10. Remove screws securing coupler drawer to equipment, and pull drawer out several inches. Coupler adapter and transmitter ALARM lamps must light. Switch coupler adapter to REMOTE mode. Close coupler drawer. Reset transmitter switching to PA TUNE and back to COUPLER TUNE.

Step 11. Rotate coupler TUNE/OPERATE switch to OFF and then to TUNE 1 position.

Note

Make sure that all other couplers are in OFF position. Rotate coupler OUTPUT COUPLING control in the maximum DECREASE direction to the stop. Check that coupler EMERGENCY switch is in the OFF position. NORMAL lamp should light, transmitter TUNE lamp should light.

Step 12. Rotate TUNE/OPERATE switch to TUNE 2 position. NORMAL and transmitter TUNE lamps should remain lit.

Step 13. Rotate TUNE/OPERATE switch to TUNE 3 position. Rotate OUTPUT COUPLING control at least 3 turns in the INCREASE direction. NORMAL and transmitter TUNE lamps should remain lit.

Step 14. Depress TUNE/OPERATE switch, rotate to OPERATE position and release. Transmitter TUNE lamp should go out. After 1.5-second delay, transmitter OPERATE lamp should light. NORMAL lamp on coupler should remain lit.

Step 15. Depress TUNE/OPERATE switch and rotate to TUNE 3 position. NORMAL lamp should extinguish, RETUNE lamp should light, transmitter OPERATE, TUNE, and ALARM lamps should be extinguished.

Step 16. On power supply panel 1A5, operate POWER ON/OFF switch OFF. After 15 seconds, operate POWER ON/OFF switch to ON. NORMAL lamp should light, transmitter TUNE lamp should light. Rotate TUNE/OPERATE switch to OPERATE position.

Step 17. At the NTDS matrix, break matrix crosspoint connecting transmitter to coupler. Coupler RETUNE lamp should light. Transmitter ALARM lamp should light.

Step 18. At the NTDS matrix, remake the matrix crosspoint connecting the transmitter to the coupler. Reset transmitter by switching to PA TUNE and back to COUPLER TUNE. Coupler RETUNE lamp should remain lit, transmitter ALARM, TUNE, and OPERATE lamps should be extinguished.

Step 19. On power supply panel 1A5, operate POWER ON/OFF switch to OFF. After 15 seconds, operate POWER ON/OFF switch to ON. Coupler NORMAL lamp should light.

Step 20. Switch transmitter to PA TUNE and back to COUPLER TUNE. Transmitter ALARM, TUNE, and OPERATE lamps should be extinguished. Coupler RETUNE lamp should light.

Step 21. Rotate coupler TUNE/OPERATE switch to OFF, and OUTPUT COUPLING control in the DECREASE direction to the stop.

Step 22. Transmitter ALARM, TUNE, and OPERATE lamps should be extinguished. Switch transmitter PLATE SUPPLY to ON. Coupler RF POWER FORWARD and RF POWER REFLECTED meters should show no indication.

Step 23. Rotate FREQ ADJUST INPUT and FREQ ADJUST OUTPUT to indicate same frequency as transmitter.

Step 24. Rotate TUNE/OPERATE switch to TUNE 1 position. NORMAL lamp should light. Transmitter TUNE lamp should light. RF POWER FORWARD meter should indicate a transmitter output of 50 to 200 watts. Adjust transmitter if necessary.

Step 25. Rotate FREQ ADJUST INPUT slightly to peak RF POWER REFLECTED meter indication and lock FREQ ADJUST INPUT.

Step 26. Rotate TUNE/OPERATE switch to TUNE 2 position. Rotate FREQ ADJUST OUTPUT slightly to dip RF POWER REFLECTED meter indication.

Step 27. Rotate TUNE/OPERATE switch to TUNE 3 position. Rotate OUTPUT COUPLING control to dip RF POWER REFLECTED meter indication.

Step 28. Carefully adjust FREQ ADJUST OUTPUT to minimize RF POWER REFLECTED meter indication. Alternately adjust OUTPUT COUPLING and FREQ ADJUST OUTPUT until lowest possible RF POWER REFLECTED meter indication is obtained.

Step 29. Depress TUNE/OPERATE switch, rotate to OPERATE position, and release. Indication on RF POWER FORWARD meter should immediately go to zero and transmitter TUNE light should extinguish. After a 1.5-second delay, transmitter OPERATE lamp should light. If transmitter is modulated, full transmitter output (up to 1 kw average) may be applied and power level will be indicated on RF POWER FORWARD meter.

Step 30. For coupler groups used with the AN/SRC-16 only: Key transmitter using remote key. If RF POWER FORWARD meter shows the presence of rf power, proceed to Step 31. AN/SRC-16 transmitters cannot be remotely keyed unless rf chokes are installed in the coupler group RF Relay assembly to provide a DC ground on the rf transmission line (See para. 4.3.2.2 and NTDS Interface Adapter installation instructions).

Step 31. Modulate transmitter (local key may be used), and reduce transmitter excitation until RF POWER FORWARD indication is approximately 10 watts.

Step 32. Withdraw antenna coupler drawer several inches from cabinet to trip drawer interlock switch. RF POWER FORWARD indication should immediately drop to zero, and transmitter ALARM lamp should light. Close antenna coupler drawer and replace screws. RF POWER FORWARD indication should remain zero.

Step 33. Rotate TUNE/OPERATE switch at OFF.

Step 34. Repeat, starting at Step 1, for the other three couplers of the group.

5.2.1.5.2 Relative Measurement of Insertion Loss

The following procedures establish the reference standards for the relative insertion loss and settings of the OUTPUT COUPLING control for standard operating parameters of each antenna coupler in the coupler group. The reference standards are used to evaluate the performance of the rf circuits within the equipment as a quick check for deterioration of performance. The relative measurement of insertion loss is not as precise as the detailed measurement procedure given in paragraph 5.2.1.5.5, but it is a much simpler procedure to perform and will provide data that is sufficient to evaluate the overall performance of the antenna coupler.

To obtain repeatable OUTPUT COUPLING numbers all antenna couplers in each coupler group should be restored to the standard position in the equipment cabinet (the position at installation, see paragraph 2.4.3.3); the same dummy load should be used each time the procedure is performed; and the dummy load should be checked to ensure that its characteristics have not deviated more than ±1 ohm from the value stamped on the nameplate or from previously measured values.

If these procedures yield measurements that might indicate a deterioration of performance, refer to paragraph 5.2.1.5.3 and perform the worst case, 3-to-1 vswr load measurement as a further check.

5.2.1.5.2.1 Test Equipment and Test Setup

The test equipment required for the measurement of relative insertion loss is given below; the test setup required is shown in figure 5-3.

a. One transmitter, on board, 2 to 30 mc, 1 kw average

b. One electrical dummy load, DA-242/U

c. One multimeter, ME-303/U

d. Two coaxial "T" probe adaptors, CAQI-11042A or equivalent

e. RF cables and adaptors, as required

5.2.1.5.2.2 Measurement Procedures

Perform the procedures given below for each antenna coupler in the group. For consistency and to minimize the time required, measure the characteristics of antenna coupler 1A1 and repeat the procedures for antenna couplers 1A2, 1A3, and 1A4 in that order for the lower test frequency. For the upper test frequency, reverse the order and measure the characteristics of antenna couplers 1A4, 1A3, 1A2, and 1A1. For an eight-channel configuration repeat the entire procedure for the second coupler group.

Step 1. Secure the complete coupler group (both groups for an eight-channel configuration) in accordance with paragraph 3.3.2.5.

Step 2. Connect test equipment as shown in figure 5-3. Connect transmitter output test cable to the input (1A6A2J1) of antenna coupler 1A1.

Step 3. Set transmitter to the lower test frequency (F1) in table 5-5.

Step 4. Refer to paragraph 3.3.2, and tune and load the transmitter and antenna coupler for normal operation. Bring the antenna coupler up to the operate condition using a nominal 1-kw average (cw) transmitter power. Allow 15 minutes for the antenna coupler to warm up.

Step 5. Adjust transmitter power as required to obtain an indication of 1 kw on antenna coupler RF POWER FORWARD meter.

Step 6. Record FREQ ADJUST INPUT, FREQ ADJUST OUTPUT, and OUTPUT COUPLING control settings on the data sheet (see table 5-6).

Step 7. Set multimeter ME-303/U to the 300-volt ac scale.

WARNING

Use extreme care when performing steps 8 and 9. High rf voltages that may cause serious and painful burns are present at the coaxial "T" probe connectors.

Step 8. Insert the probe of the multimeter into the coaxial T probe connector installed between the transmitter and antenna coupler. Record the voltage indication on the multimeter as RF Input Volts in the data sheet.

5.2.1.5.4.1 Test Equipment

The following test equipment is required for these procedures.

a. One multimeter, AN/PSM-4 ( )

b. One digital voltmeter, Digitec Model 202, or equivalent

c. One control system cable and test set special (see paragraph 5.2.1.2.1)

5.2.1.5.4.2 Voltage Sensor Check

This check ensures that voltage sensor components are within specification prior to calibration of the associated circuits. Refer to paragraph 4.3.5.3.3.1 for a description and simplified schematic diagram of the voltage sensors.

Step 1. Secure the antenna coupler under test by rotating the TUNE/OPERATE switch to OFF, and the OUTPUT COUPLING control in the DECREASE direction to the stop.

Step 2. Remove the six screws that secure the antenna coupler drawer to the equipment cabinet, and pull the coupler drawer out to the stops.

Step 3. Remove the control cable from receptacle J1 on the rear of the coupler drawer (see figures 5-32 for location of J1).

Step 4. Remove the bottom cover from the coupler drawer.

Step 5. Remove control circuit board A1 (see figure 5-5).

Step 6. Set the multimeter to measure resistance.

Step 7. On voltage sensor A3, connect positive lead of multimeter to terminal E1 and negative lead to terminal E3 (see figure 5-6 for location of terminals). Multimeter must indicate less than 10 ohms.

Step 8. Connect positive lead of multimeter to terminal E1 and negative lead to terminal E4. Multimeter must indicate between 20 K and 30 K ohms.

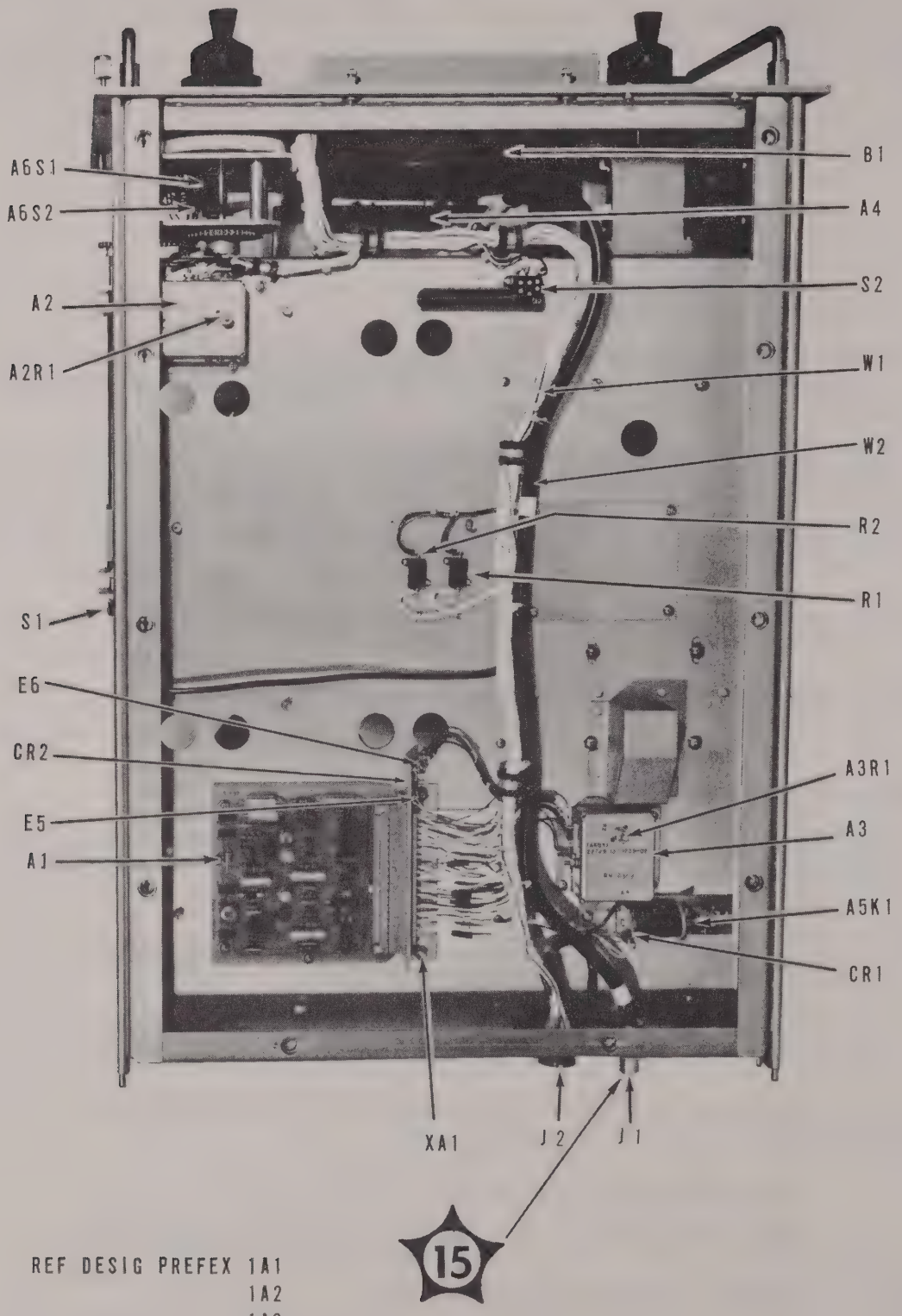
Step 9. Reverse multimeter leads so that the positive lead is connected to terminal E4 and negative lead to terminal E1. Multimeter must indicate approximately 250 K.

Step 10. Disconnect multimeter from voltage sensor A3 and repeat step 7 for voltage sensor A2. Multimeter must indicate an open circuit.

Step 11. Repeat steps 8 and 9 for voltage sensor A2.

Step 12. Disconnect multimeter and replace control circuit board A1.

Step 13. Replace control cable on receptacle J1.



REF DESIG PREFEX 1A1
1A2
1A3
1A4

80119-031

Figure 5-5 Antenna Coupler Bottom View, Location of Components

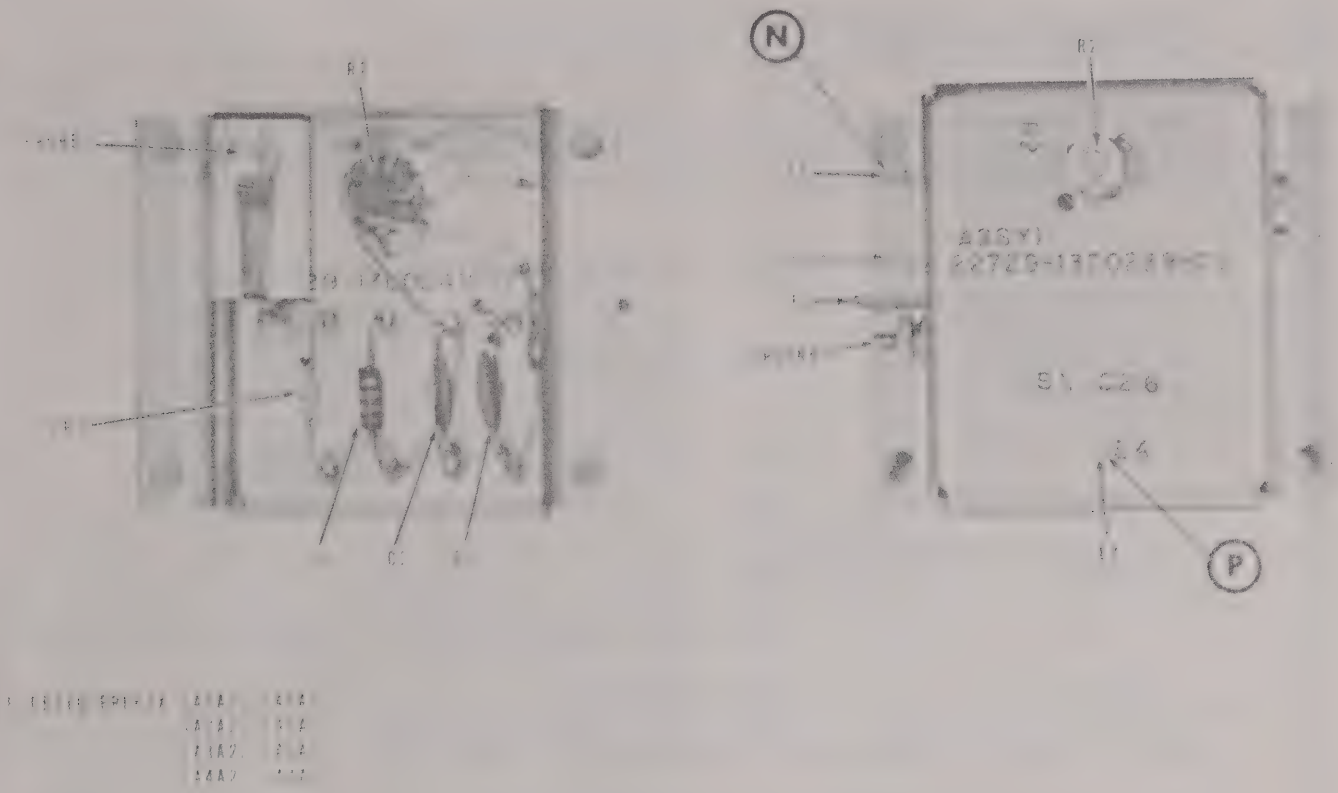


Figure 5-6. Voltage Sensor, Location of Components

5.2.1.5.4.3 Transmitter Interlock, Keyline, Automatic Decoupling and RF Relay

These circuit checks ensure that the transmitter interlock and keyline, automatic decoupling and rf relay control circuits operate as required during the tuning and operating procedures. This check of the transmitter interlock and keyline must be performed as part of the installation checkout prior to applying rf power to the antenna coupler (see paragraph 2.4.3.1). Refer to paragraph 4.3.5.3.4.1, paragraph 4.3.5.3.4.3 and paragraph 4.3.5.3.4.4 for descriptions and simplified schematic diagrams of these circuits. All checks are performed with antenna coupler drawers closed, except where otherwise indicated.

Step 1. Disconnect NTDS control wiring from barrier terminal strip on interface adapter unit section serving coupler to be checked. (Interface adapter 1A6A8TB1 for top-most coupler 1A1, 1A6A8TB2 for 1A2, 1A6A8TB3 for 1A3, 1A6A8TB4 for bottom-most coupler 1A4.)

Note

In many installations, NTDS control wiring can be disconnected at NTDS coupler adapter by removing a single multipin connector.

Step 2. On the interface adapter terminal strip associated with the coupler under test, connect a temporary jumper from terminal 7 (OPERATE line) to terminal 8 (GROUND).

Step 3. Check to ensure that the TUNE/OPERATE switches on other couplers are either in the OFF or OPERATE position.

Step 4. Behind the equipment rack near the bottom, disconnect the rf transmission line associated with the coupler under test. (A2J1 for coupler 1A1, A3J1 for 1A2, A4J1 for 1A3, A5J1 for 1A4.) Connect an ohmmeter to measure resistance between the center pin of J1 and ground.

Step 5. Rotate the TUNE/OPERATE switch through all positions starting with OFF and check that resistance readings are:

TUNE/OPERATE switch position	OUTPUT COUPLING set to	RESISTANCE in ohms
OFF	Min	Open
TUNE 1	Min	50
TUNE 2	Min	50
TUNE 3	2 turns from min	50
OPERATE	2 turns from min	Open

Step 6. Replace rf transmission line removed in Step 4.

Step 7. On interface adapter terminal strip associated with coupler under test, connect ohmmeter to measure continuity from terminal 4 (CARRIER INSERT line) to ground. Connect positive lead of ohmmeter to terminal 4. Rotate TUNE/OPERATE switch through following positions in order given and check that continuity readings are:

TUNE/OPERATE switch position	OUTPUT COUPLING set to	Continuity Indication
OFF	Min	Open
TUNE 1	Min	Short
TUNE 2	Min	Short
TUNE 3	2 turns from min	Short
OPERATE	2 turns from min	Open
TUNE 3	2 turns from min	Open

Step 8. On interface adapter terminal strip associated with coupler under test, connect ohmmeter to measure continuity from terminal 3 (TUNE COMPLETE line) to ground. Rotate TUNE/OPERATE switch through following positions in order given; check that continuity readings are:

TUNE/OPERATE switch position	OUTPUT COUPLING set to	Continuity Indication
OFF	Min	Open
TUNE 1	Min	Open
TUNE 2	Min	Open
TUNE 3	2 turns from min	Open
OPERATE	2 turns from min	Short
TUNE 3	2 turns from min	Open
OPERATE	2 turns from min	Open

Step 9. On power supply panel 1A5, operate POWER ON/OFF switch to OFF. After 15 seconds, operate POWER ON/OFF switch to ON. NORMAL lamp should light. On the interface adapter terminal strip associated with the coupler under test, apply a momentary ground to terminal 9 (TUNE-ACTIVATE). Coupler RETUNE lamp should light and remain lit.

Step 10. On the interface adapter terminal strip, remove the temporary jumper installed in Step 2. Operate coupler EMERGENCY switch to ON position. On power supply panel 1A5, operate POWER ON/OFF switch to OFF. After 15 seconds, operate POWER ON/OFF switch to ON. NORMAL lamp should light.

Step 11. Operate coupler EMERGENCY switch to OFF position. Coupler RETUNE lamp should light.

Step 12. On interface adapter terminal strip associated with coupler under test, connect ohmmeter to measure continuity from terminal 5 (ALARM line) to ground. Ohmmeter should indicate continuity to ground.

Step 13. Rotate TUNE/OPERATE switch to OFF. Pull the coupler drawer out to the stops. Ohmmeter should indicate an open circuit.

Step 14. On the antenna coupler, tape the vane of the airflow switch 1A( )S2 so that it is held in the normal operate position (see Figure 5-5) for location of switch S2.

Step 15. On the coupler, operate EMERGENCY switch to ON position. Rotate OUTPUT COUPLING control in the maximum DECREASE direction to the stop.

Step 16. Rotate TUNE/OPERATE switch to TUNE-1. Fan must run. NORMAL indicator must light, and automatic decoupling switch solenoid A5K1 must not energize.

Step 17. Rotate TUNE/OPERATE switch to TUNE-2; NORMAL indicator must remain lit and solenoid A5K1 must energize.

Step 18. Rotate TUNE/OPERATE switch to TUNE-3; NORMAL indicator must remain lit and solenoid A5K1 must remain energized.

Step 19. Rotate OUTPUT COUPLING control two revolutions in the INCREASE direction. NORMAL indicator must remain lit and solenoid A5K1 must remain energized.

Step 20. Rotate TUNE/OPERATE switch to OPERATE and release the switch. NORMAL indicator must remain lit and solenoid A5K1 must remain energized.

Step 21. Roteat OUTPUT COUPLING control in the DECREASE direction to the stop. RETUNE indicator must light, NORMAL indicator must go out, and solenoid A5K1 must deenergize.

Step 22. Rotate OUTPUT COUPLING control two revolutions in the INCREASE direction. RETUNE indicator must remain lit and solenoid A5K1 must remain deenergized.

Step 23. On power supply front panel at base of coupler unit, remove fuse associated with coupler under test for 15 seconds. (Fuse F3 for 1A1, F4 for 1A2, F5 for 1A3, F6 for 1A4). Replace fuse. On antenna coupler, solenoid A5K1 must energize, NORMAL indicator must light, and RETUNE indicator must go out.

Step 24. On the coupler, operate EMERGENCY switch to OFF position. NORMAL indicator must go out and RETUNE indicator must light.

5.2.1.5.4.4 Excessive VSWR Control and Protection Circuit Calibration

This procedure calibrates the excessive vswr circuit so that the protective devices will activate when the reflected power toward the transmitter reaches the equivalent of 3:1 at a 1-kw forward power level (250 watts reflected power). Refer to paragraph 4.3.5.3.4.7 for a description and simplified schematic diagram of the excessive vswr protective circuit.

Step 1. Connect special control system cable and test set (see paragraph 5.2.1.2.1 and figure 5) in series with the antenna coupler control cable and receptacle J1 at coupler drawer.

Step 2. On the coupler, operate EMERGENCY switch to ON position.

Step 3. On the test set, press switch S4 and hold for 15 seconds. Release switch S4. On coupler, NORMAL indicator must light.

Step 4. On the test set, rotate potentiometer R4 to its midrange position, and connect digital voltmeter to J4(+) and J5(-).

Step 5. Press and hold switch S1, and slowly rotate potentiometer R4 to increase the voltage indication on the digital voltmeter. Indication on antenna coupler RF POWER REFLECTED meter must also increase.

Step 6. Continue to rotate potentiometer R4 until digital voltmeter indicates 1.335 volts, or antenna coupler RETUNE indicator lights. Release switch S1.

Step 7. If RETUNE indicator lights when the digital voltmeter indicates less than 1.335 volts, proceed with Step 8. If RETUNE indicator does not light when the digital voltmeter indicates 1.335 volts, proceed with Step 11.

Step 8. On test set, press switch S4 and hold for 15 seconds. Release switch S4. On antenna coupler, NORMAL indicator must light and RETUNE indicator must go out.

Step 9. On the circuit control board A1, rotate the adjustment screw of potentiometer A1R21 one revolution counterclockwise and press S1 (see figure 5-43) for location of potentiometer A1R21).

Step 10. Repeat Step 9 as often as required until RETUNE indicator does not light when the digital voltmeter indicates 1.335 volts.

Step 11. On test set, press and hold switch S1. On circuit control board, rotate the adjustment screws of potentiometer A1R21 counterclockwise until RETUNE indicator lights. Release switch S1.

Step 12. On test set, press switch S4 and hold for 15 seconds. Release switch S4. On antenna coupler, NORMAL indicator must light and RETUNE indicator must go out.

Step 13. Press switch S1. RETUNE indicator must light. RF POWER REFLECTED meter must indicate 250 ±12.5 watts.

5.2.1.5.4.5 Input Resonator Voltage Sensor A2 Calibration

This procedure sets input resonator voltage sensor A2 potentiometer so that a given output from the voltage sensor will indicate a given level on the RF POWER REFLECTED meter. These procedures are a continuation of the procedures given above and the final conditions of those procedures must be maintained: antenna coupler OUTPUT COUPLING control must be two revolutions in the INCREASE direction and the digital voltmeter must be connected to test set terminals J4(+) and J5(-). Refer to paragraphs 4.3.5.3.3.1 and 4.3.5.3.3.2 for descriptions and simplified schematic diagrams of the voltage sensor and RF POWER REFLECTED meter.

Step 1. On the test set, operate switch S3 to the overvoltage position.

Step 2. Press and hold switch S1, and rotate potentiometer R4 until the digital voltmeter indicates the calibration voltage for voltage sensor A2 given in table 5-11.

TABLE 5-11. CALIBRATION VOLTAGES FOR VOLTAGE SENSORS

COUPLER GROUP	ANTENNA COUPLER	VOLTAGE SENSOR A2	VOLTAGE SENSOR A3
AN/SRA-56	CU-1772	0.48 vdc	41.8 vdc
AN/SRA-57	CU-1774	0.12 vdc	26.8 vdc
AN/SRA-58	CU-1776	0.07 vdc	32.1 vdc

Step 3. Connect one test lead from test set terminal J2(+) to input resonator voltage sensor A2 terminal E4 and a second test lead from test set terminal J3(-) voltage sensor terminal E1.

Step 4. Rotate TUNE/OPERATE switch to TUNE-1. RETUNE indicator must light. (OUTPUT COUPLING not set properly.)

Step 5. On the test set, press and hold switch S1 and rotate input resonator voltage sensor A2 potentiometer R2 until RF POWER REFLECTED meter indicates 150 watts. Release switch S1.

Step 6. Rotate TUNE/OPERATE switch to OFF, and disconnect test leads from voltage sensor A2 and from the test set.

5.2.1.5.4.6 Overvoltage Protective Circuit Calibration

This procedure sets output resonator voltage sensor A3 potentiometer R2 so that a given output from the voltage sensor activates the protective devices in the overvoltage control circuit when the rf voltage in the output resonator exceeds 6.25 kv rms. Refer to paragraph 4.3.5.3.4.7 for a description and simplified schematic diagram of the overvoltage protective circuit.

Note

This calibration procedure is relative. The overvoltage protective circuit may trip under peak load during operation. If this occurs, apply two-tone test signal from transmitter and adjust A3R2 to trip the circuit between 1100 and 1300 watts on the RF POWER FORWARD meter using trial and error methods.

Step 1. On the test set, connect the digital voltmeter between the test set output terminals J8(+) and J9(-).

Step 2. On the test set, press and hold switch S2, and rotate potentiometer R5 until the digital voltmeter indicates the calibration voltage for voltage sensor A3 in table 5-11.

Step 3. On the test set, connect one test lead from terminal (J6(+) to output resonator voltage sensor A3 terminal E4 and a second test lead from test set terminal J7(-) to voltage sensor terminal E1.

Step 4. Rotate TUNE/OPERATE switch to TUNE-3. RETUNE indicator must light.

Step 5. On voltage sensor A3, rotate potentiometer R2 counterclockwise to the stop.

Step 6. On test set, press switch S4 and hold for 15 seconds. Release switch S4. NORMAL indicator must light and RETUNE indicator must go out.

Step 7. On the test set press and hold switch S2, and rotate voltage sensor A3 potentiometer R2 until RETUNE indicator lights and NORMAL indicator goes out. Release switch S2.

Step 8. Press test set switch S4 and hold for 15 seconds. Release switch S4. NORMAL indicator must light and RETUNE indicator must go out.

Step 9. Press test set switch S2. RETUNE indicator must light and NORMAL indicator must go out. Release switch S2.

Step 10. If RETUNE indicator does not light as required in step 9 repeat steps 7 through 9 again.

Step 11. Rotate TUNE/OPERATE switch to OFF and OUTPUT COUPLING control in the DECREASE direction to the stop.

Step 12. Disconnect test leads and special control system cable and test set.

Step 13. Replace bottom cover, connect antenna coupler control cable, and secure the coupler drawer assembly within the equipment cabinet.

Step 14. Repeat the entire calibration procedure for the remaining antenna couplers in the group or configuration.

Note

If multicoupler RETUNE indicator lights, operate EMERGENCY switch to ON; switch primary power to OFF for 15 seconds, then switch primary power to ON. NORMAL indicator must light. Do not disturb the settings of FREQ ADJUST INPUT, FREQ ADJUST OUTPUT, or OUTPUT COUPLING controls through step 8.

Step 3. Connect the test equipment as shown in figure 5-7 and set coaxial switches so that main signal path is from the signal generator through the antenna coupler under test to the dummy load.

Step 4. Set the signal generator to the same frequency as the transmitter in step 1, using the digital electronic counter to obtain the precise frequency.

Step 5. Record the voltages indicated on the voltmeter 1 (input) and voltmeter 2 (output).

Step 6. Set the coaxial switches so that the main signal path is from the signal generator through the bypass precision attenuator to the dummy load.

Step 7. Ensure that the voltmeter 1 (input) indicates the same as in step 5 by readjusting the signal generator if necessary.

Step 8. Adjust the bypass precision attenuator until the voltmeter 2 (output) indicates the same as in step 5. The value of attenuation required to obtain the same indication is the measured insertion loss. Record this value on the data sheet (table 5-12).

Step 9. Disconnect all test equipment.

Step 10. Repeat steps 1 through 9 for the upper test frequency (F2) given in table 5-5.

Step 11. Secure the antenna coupler.

Step 12. Repeat steps 1 through 12 for other antenna couplers as required.

5.2.1.5.6 Isolation Between Channels

The following procedures measure the degree of isolation between channels in a coupler group or eight-channel configuration. It is isolation that prevents interaction between the several transmitters operating through the same group or configuration, provided that the transmitters are separated at least 5 percent in frequency.

The measurement of isolation is not required as part of scheduled preventive maintenance, but should be performed when previous reference standards measurements indicate that trouble may be present in the equipment and at installation to establish the initial reference standards.

In these procedures, the isolation between all channels must be determined because of the possibility that interaction may be caused by an antenna coupler not even suspected of being faulty. Before isolation between channels is measured, the characteristics of the channel (antenna coupler) ±5 percent off frequency must be determined to establish the attenuation of the rf signal from another transmitter coupling into that channel during operation.

For consistency, start the procedures by measuring the isolation between antenna couplers 1A1 and 1A2 and repeat the procedures to determine the isolation between antenna couplers 1A2 and 1A3, 1A3 and 1A4, and 1A4 and 1A1.

If the isolation measurements indicate that trouble may be present in an antenna coupler or coupler group, pull the equipment for corrective maintenance.

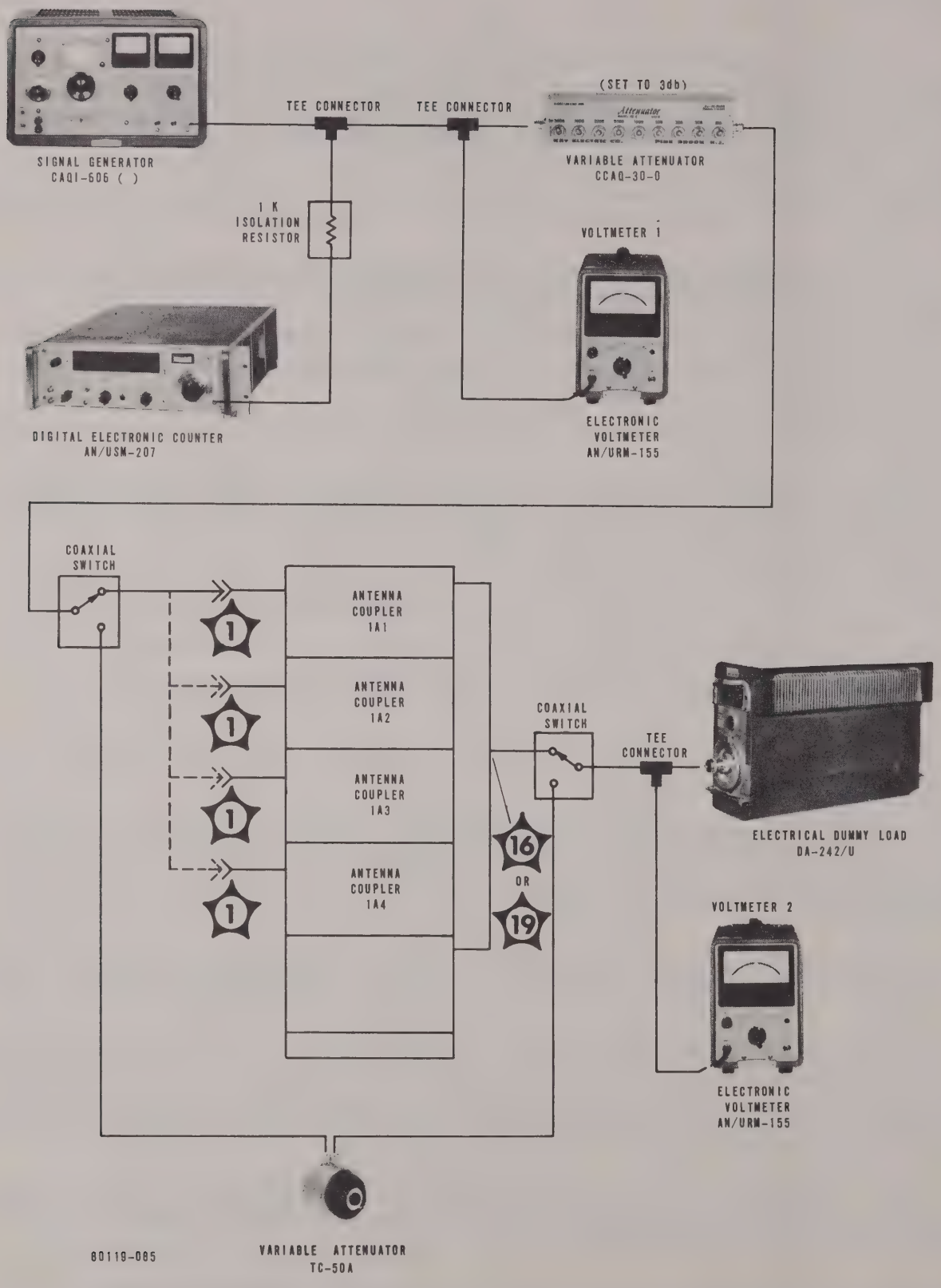


Figure 5-7. Test Setup for Detailed Measurement of Insertion Loss

5.2.1.5.6.1 Test Equipment and Test Setups

The test equipment required for the measurement of isolation is given below, three test setups are required as shown in figures 5-8, 5-9, and 5-10.

a. One transmitter, on board, 2 to 30 mc, 1-kw average power

b. One signal generator, CAQI-606( )

c. One variable attenuator, CCAQ-30-0

d. One digital electronic counter, AN/USM-207

e. One electrical dummy load, DA-242/U

f. Two electronic voltmeters, AN/URM-155

g. One resistor, fixed, shielded, 1 K

h. One 50-ohm termination, Microlab/FRX TA-5MN

i. RF cables and connectors, as required

5.2.1.5.6.2 Measurement Procedures

The measurement of isolation consists of three parts. In the first part, an antenna coupler (channel A) is tuned to a test frequency (F), and the attenuation characteristics of channel A alone (all other channels are off) are determined at 5 percent off-frequency (F + 5% and F - 5%). In the second part, a second antenna coupler (channel B) is tuned 5 percent away (F + 5%, F - 5%) from the operating frequency (F) of channel A, and the attenuation characteristics of channel A are measured again to determine any interaction presented by channel B. In the third part, the isolation between channel A and channel B is determined from the attenuation of a signal (F ±5%) applied to the input of channel B as measured at the input of channel A (resonant at F).

Step 1. Designate the channel associated with antenna coupler 1A1 as channel A and the channel associated with antenna coupler 1A2 as channel B.

Step 2. Secure the complete coupler group (both groups for an eight-channel configuration) in accordance with paragraph 3.3.2.5. Ensure that the TUNE/OPERATE switch on antenna couplers 1A2, 1A3, and 1A4 are in the OFF position.

Step 3. Connect the test equipment as shown in figure 5-8 with transmitter connected to channel A.

Step 4. Set transmitter to the lower, center test frequency (F1) in table 5-13.

Step 5. Refer to paragraph 3.3.2 and tune and load the transmitter and antenna coupler for normal operation. Bring the antenna coupler up to the OPERATE condition. Allow 15 minutes for the antenna coupler to warm up.

Note

Leave the TUNE/OPERATE switch on the antenna coupler in OPERATE. Do not disturb any of the other controls for the remainder of these procedures.

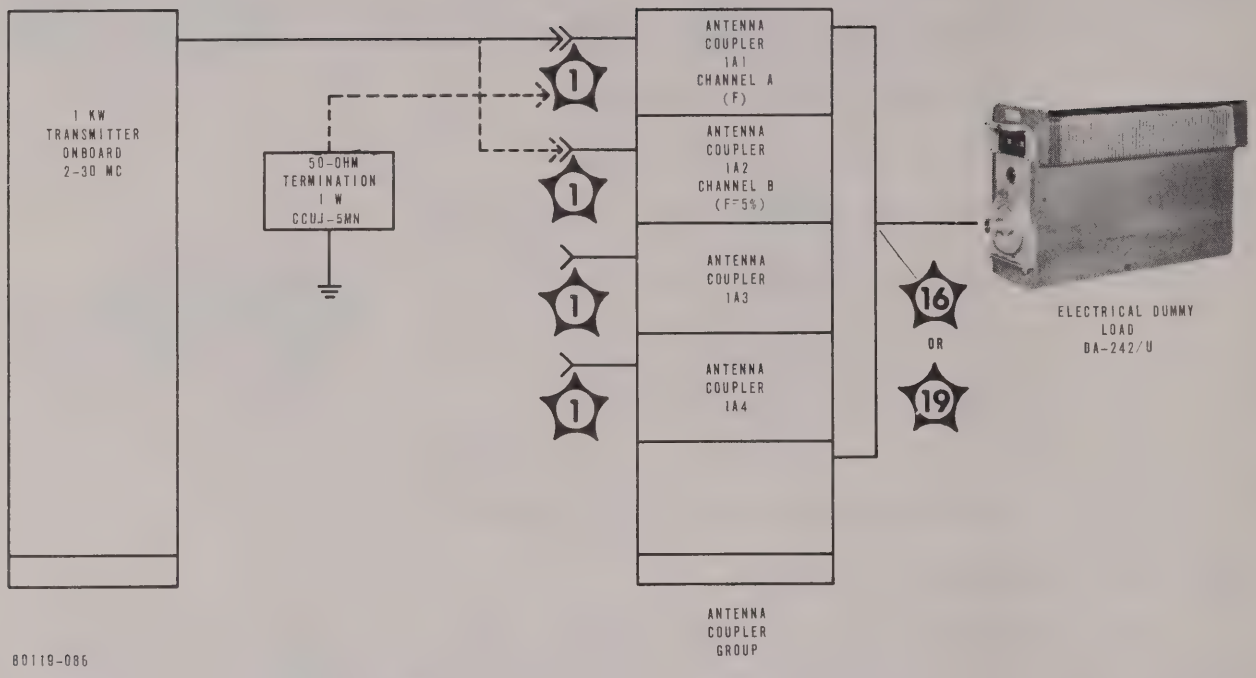


Figure 5-8. Test Setup 1 for Measurement of Isolation

Step 6. Operate antenna coupler EMERGENCY switch to ON position. Deenergize and disconnect the transmitter.

Step 7. Connect the test equipment as shown in figure 5-9 to channel A. Set the signal generator to the exact lower, center test frequency (F1) in table 5-13, using the electronic counter.

Step 8. Set the variable attenuator to 60 db.

Step 9. Adjust the signal generator output level to obtain an indication of 1 millivolt on voltmeter 2. Note the indication on voltmeter 1 and maintain this indication through step 12 by adjusting the signal generator output as required.

Step 10. Set the signal generator to 5 percent above center test frequency (F1 + 5%) shown in table 5-13.

Step 11. Adjust the variable attenuator until voltmeter 2 again indicates 1 millivolt.

Step 12. Subtract the attenuator setting in step 11 from that in step 8 (60 db) and record this value in the data sheet (table 5-14). The attenuation must be greater than 33 db.

5.3.1.16 Impedance Matching Network CU-1773/SRA-56 and CU-1775/SRA-57

To remove, repair, or replace an impedance matching network, proceed in the following manner.

WARNING

Remove all rf input cables from the equipment cabinet(s) and 115-volt ac power at the source before proceeding.

Step 1. Remove rf output cable from connector 1J1 (see figure 5-40 for location of connector 1J1).

Step 2. Remove cover from impedance matching network by removing the 14 retaining screws, and remove ground lead to connect 1J1.

Step 3. Repair the impedance matching network by replacing any defective components (see figures 5-41 and 5-42 for location of components).

Note

If only repair is required, no further removal procedures are necessary. All impedance matching network components are accessible when the cover is removed. If the impedance matching network is to be removed completely from the units, proceed with step 4.

Step 4. Remove the straps between the chassis of the impedance matching network and the lower end connector of 1A6J1 on each cabinet. Retain the mounting hardware.

WARNING

Have two men support the impedance matching network when removing it from the cabinet.

Step 5. Disconnect 1P2 and 1P3 from connectors 1A6J1 on each equipment cabinet and remove the mounting screws.

Step 6. Lift the impedance matching network from the cabinets.

Step 7. Replace the impedance matching network by reversing the removal procedures.

5.3.1.17 NTDS Interface Adapter Unit 1A6A8

To remove, repair, or replace an NTDS interface adapter unit, proceed as follows:

WARNING

Deenergize all transmitters, secure antenna couplers, and disconnect 115 volts ac power at the source before proceeding.

Step 1. Remove power supply assembly 1A5 per instructions given in paragraph 5.3.1.2.

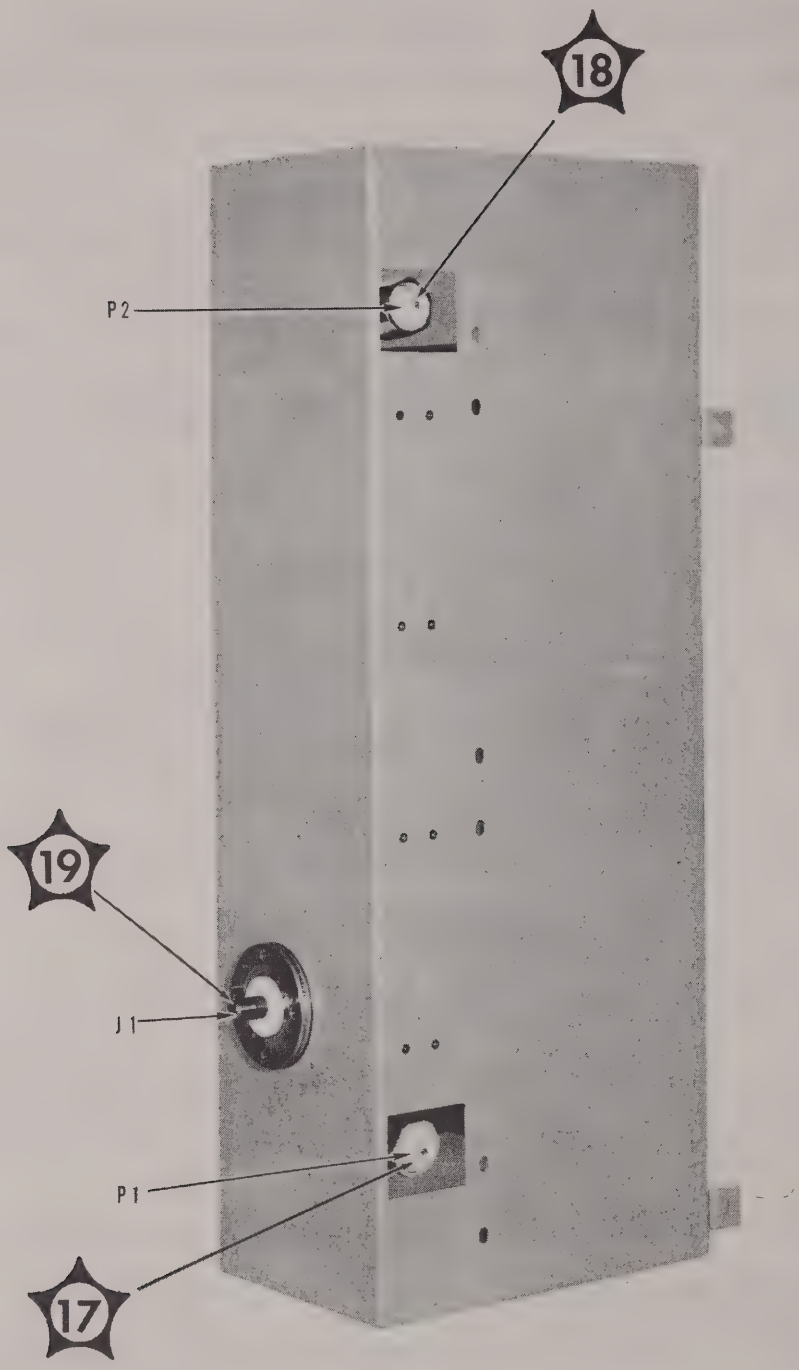


Figure 5-40. Impedance Matching Network (Typical) Front View, Location of Components

Step 2. Referring to figure 5-45A, note the six screws inside the NTDS interface adapter unit which secure the chassis to the rf relay assembly 1A6A7. Access to the two rear screws is achieved through two holes in the top of the NTDS interface adapter unit.

Step 3. Remove plug 1A6A8P1 from jack 1A6A7J11.

Step 4. Remove cable connections from 1A6TB3 and 1A6TB1.

Step 5. Referring to figure 5-45B, remove all NTDS connections to 1A6A8TB1, 1A6A8TB2, 1A6A8TB3 and 1A6A8TB4.

Step 6. Referring to figure 5-45B, disconnect antenna coupler cable plus 1A6W1P10 from 1A6A8J1.

Step 7. Remove the four screws discussed in Step 2.

Step 8. Withdraw the NTDS interface adapter unit from the electrical equipment cabinet CY-6424/SRA-56, -57, or -58.

Step 9. Remove the two securing screws and circuit control board securing bar shown in figure 5-45B.

Step 10. Circuit control boards are removed by grasping the handles and pulling (see 1A6A8A1, -A2, -A3 and -A4, figure 5-45B).

Note

Circuit control boards 1A6A8A1, 1A6A8A2, 1A6A8A3 and 1A6A8A4 are identical, and may be interchanged.

Step 11. Reassemble and replace the NTDS interface adapter unit by reversing the removal and disassembly procedures.

5.3.2 Emergency Maintenance Procedures

The emergency maintenance procedures for Antenna Coupler Groups AN/SRA-56, -57, and -58 are restricted to the substitution of interchangeable assemblies, subassemblies, or components.

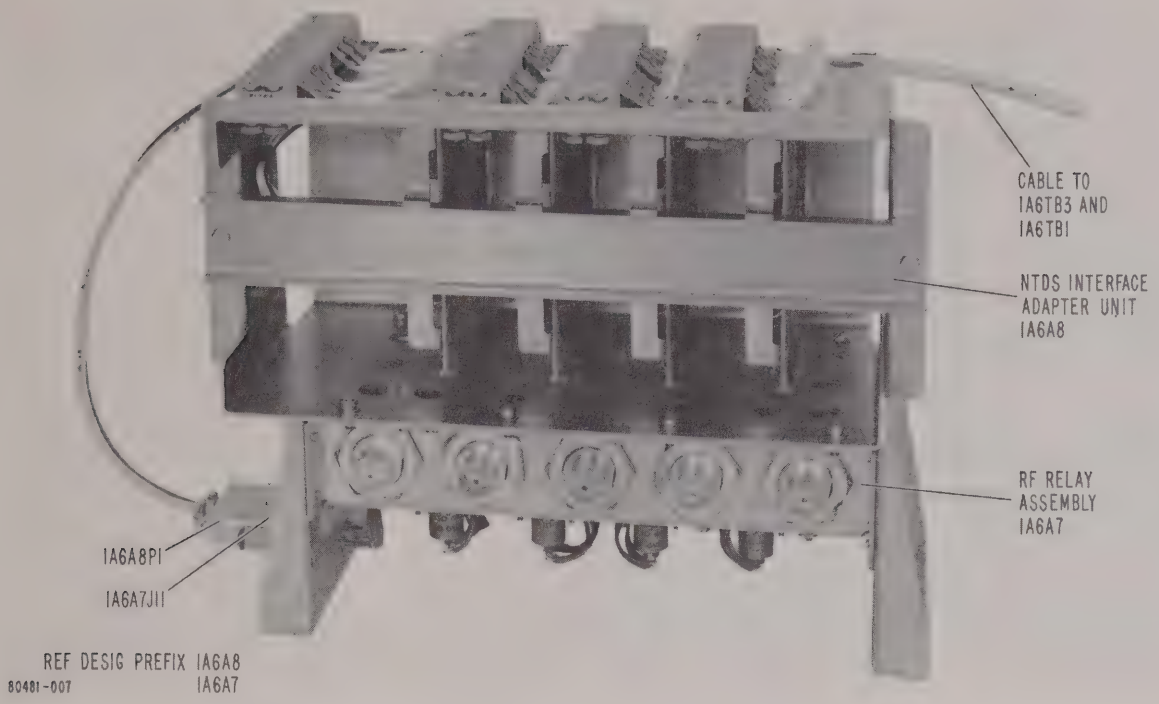


Figure 5-45A. NTDS Interface Adapter Unit 1A6A8, Mounted on RF Relay Assembly 1A6A7

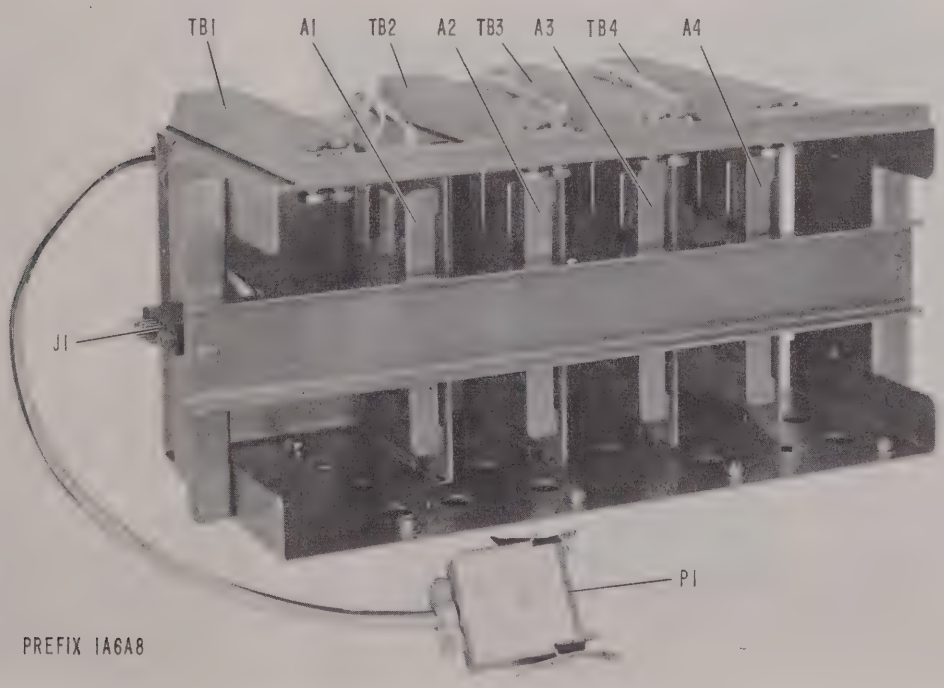


Figure 5-45B. NTDS Interface Adapter Unit 1A6A8, Front View, Location of Components

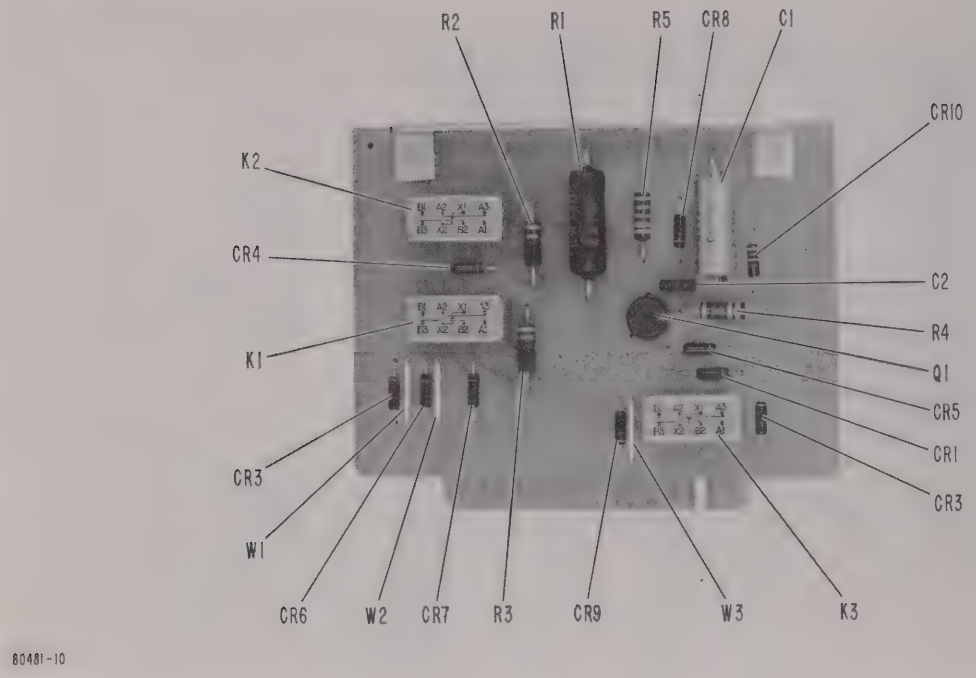


Figure 5-45C. Circuit Control Boards 1A6A8-A1, -A2, -A3 and -A4, Location of Components

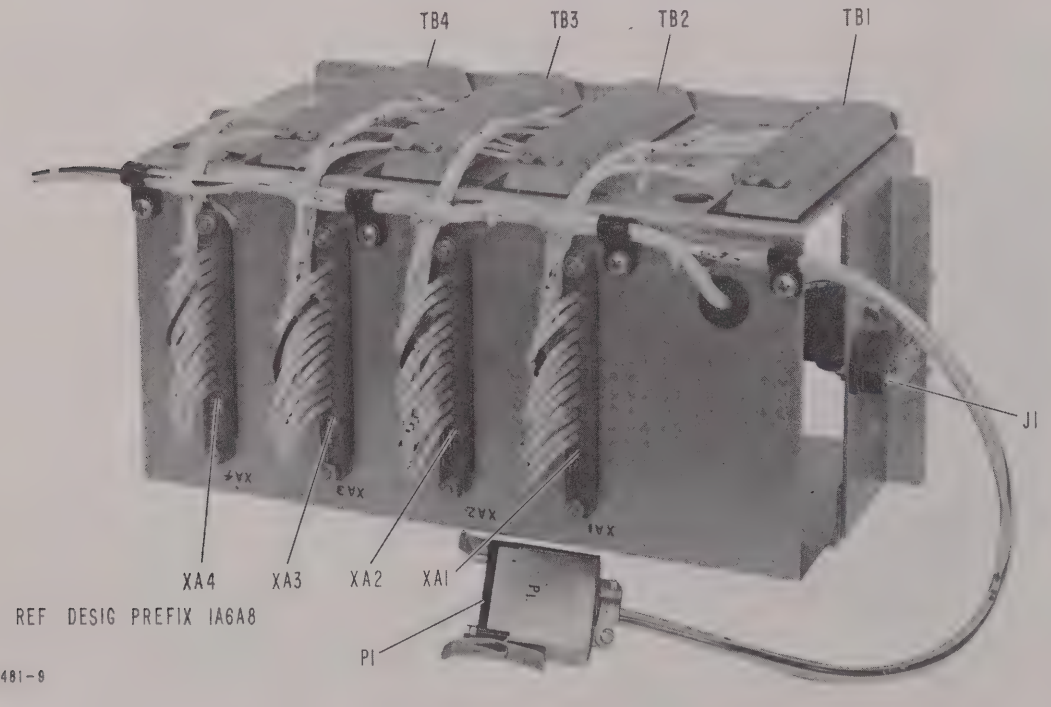


Figure 5-45D. NTDS Interface Adapter Unit 1A6A8, Rear View, Location of Components

TABLE 5-20 WIRE RUNNING LIST (Continued)

WIRE NO.	FROM		TO		NOTES
	REF. DES.	TERMINAL	REF. DES.	TERMINAL	
ELECTRICAL EQUIPMENT CABINET (Continued)					
104	C3	2	C4	2	4, 9
105	TB1	12	E1		GND
106	TB2	17	E1		GND POWER SUPPLY COMMON
107	TB3	9	1A6A8XA1	4	4, fig 5-45D and 5-28
108	TB3	10	1A6A8XA1	7	4, fig 5-45D and 5-28
109	TB3	1	1A6A8XA1	10	4, fig 5-45D and 5-28
110	TB3	11	1A6A8XA2	4	4, fig 5-45D and 5-28
111	TB3	12	1A6A8XA2	7	4, fig 5-45D and 5-28
112	TB3	3	1A6A8XA2	10	4, fig 5-45D and 5-28
113	TB3	13	1A6A8XA3	4	4, fig 5-45D and 5-28
114	TB3	14	1A6A8XA3	7	4, fig 5-45D and 5-28
115	TB3	5	1A6A8XA3	10	4, fig 5-45D and 5-28
116	TB3	15	1A6A8XA4	4	4, fig 5-45D and 5-28
117	TB3	16	1A6A8XA4	7	4, fig 5-45D and 5-28
118	TB3	7	1A6A8XA4	10	4, fig 5-45D and 5-28
119	TB1	14	1A6A8XA1	13	4, fig 5-45D and 5-28
OPERATE REFLECTOMETER 1A6A2, 1A6A3, 1A6A4, 1A6A5					
1	A2	E2	J3	A	4
2	A2	E4	J3	B	2
3	A2	E6	J3	C	4
4A	A1	E3	A2	E3	1

TABLE 5-20 WIRE RUNNING LIST (Continued)

WIRE NO.	FROM		TO		NOTES
	REF. DES.	TERMINAL	REF. DES.	TERMINAL	
OPERATE REFLECTOMETER 1A6A2, 1A6A3, 1A6A4, 1A6A5 (Continued)					
4B	E2		E4	-	BRAID OF WIRE 4A
5	A2	E5	E5	-	6
6	A2	E1	E1	-	6
7	A2	E4	E4	-	6
8	A1	E1	E3	-	6
9	A1	E2	E6	-	6
10	E3		T1	BROWN	6
11	E2		T1	RED	6
12	E4	-	T1	ORANGE	6
13	E5	-	T1	YELLOW	6
RF RELAY ASSEMBLY 1A6A7					
1	J11	A	K5	2	3
2	J11	B	K6	2	3
3	J11	C	K7	2	3
4	J11	D	K8	2	3
5	J11	E	K4	1	2
6	K3	1	K4	1	2
7	K2	1	K3	1	2
8	K2	1	K1	1	2
9	K1	1	K5	1	2
10	K5	1	K6	1	2
11	K6	1	K7	1	2
12	K7	1	K8	1	2
13	K4	2	K8	2	3

TABLE 5-20 WIRE RUNNING LIST (Continued)

WIRE NO.	FROM		TO		NOTES
	REF. DES.	TERMINAL	REF. DES.	TERMINAL	
RF RELAY ASSEMBLY 1A6A7 (Continued)					
14	K3	2	K7	2	3
15	K2	2	K6	2	3
16	K1	2	K5	2	3
TUNE REFLECTOMETER 1A6A6					
1	A1	E3	J3	B	2
2		E4	J3	C	4

TABLE 5-20 WIRE RUNNING LIST (Continued)

WIRE NO.	FROM		TO		NOTES
	REF. DES.	TERMINAL	REF. DES.	TERMINAL	
TUNE REFLECTOMETER (Continued)					
3A	A1	E3	E3		1
3B	E2	-	E4	-	BRAID OF WIRE 3A
4	A1	E2	E5	-	6
5	A1	E1	E1	-	6
6	E2		T1	RED	6
7	E3	-	T1	BROWN	6
8	E4	-	T1	ORANGE	
9	E5		T1	YELLOW	6
ANTENNA COUPLER DRAWER ASSEMBLY 1A1, 1A2, 1A3, 1A4					
1	A6S1C2	10	J1	E	1
2	J1	B	M1	(-)	1, SEE FIGURE 5-46
3	A6S1C2	11	M1	(-)	1, SEE FIGURE 5-46
4	M1	(+)	J1	A	1, SEE FIGURE 5-46
5	A6S1C1	4	J1	D	1
6	J1	C	XA1	19	1
7	J1	F	XA1	12	4
8	J1	G	XA1	8	4
9	J1	P	XA1	34	4
10	J1	R	XA1	32	4

TABLE 5-20 WIRE RUNNING LIST (Continued)

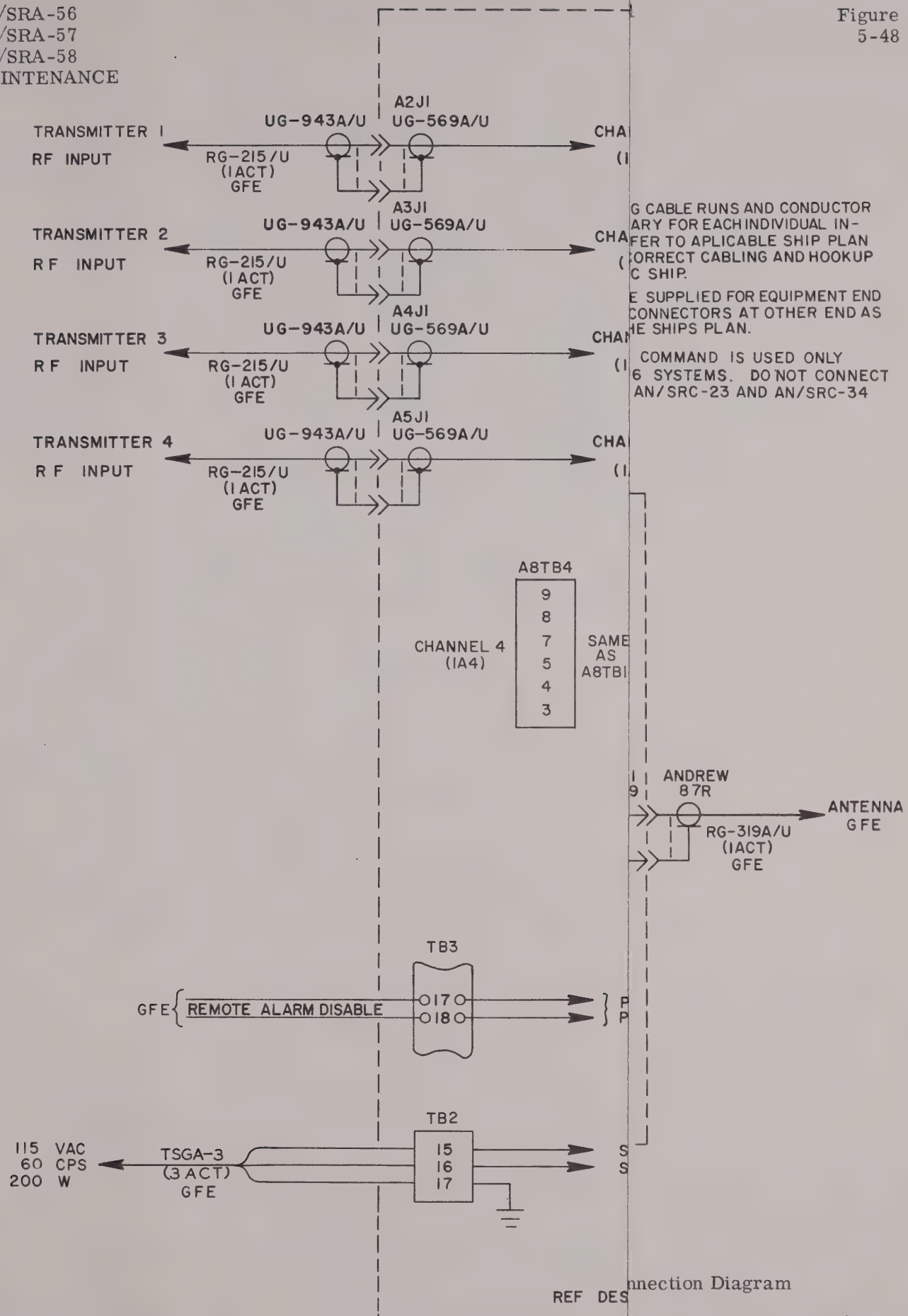
WIRE NO.	FROM		TO		NOTES
	REF. DES.	TERMINAL	REF. DES.	TERMINAL	
ANTENNA COUPLER DRAWER ASSEMBLY (Continued)					
11	J1	S	XA1	31	4
12	A6S1B1	C1	J1	H	3
13	A6S1B1	C1	XDS2	1	3, SEE FIGURE 5-46
14	XA1	2	XDS2	1	3, SEE FIGURE 5-46
15	J1	K	XA1	18	4
16	A6S1A2	10	E5ATXA1	-	4
17	A6S1A1	2	J1	N	4
18	A6S1A1	2	XA1	30	4
19	S3A	2	J1	L	4
20	A6S1A1	6	J1	M	4
21	A5K1	1	J1	T	2
22	A3	E1	XA1	25	2
23	A3	E1	R1	2	2, 12
24	R1	2	R2	2	2, 12
25	J1	X	P1	D	4
26	J1	J	XA1	1	4
27	J1	Y	P1	C	4
28	P1	B	J1	W	4

TABLE 5-21 WIRE RUNNING LIST

WIRE NO.	FROM		TO		NOTES
	REF. DES	TERMINAL	REF. DES.	TERMINAL	
NTDS INTERFACE ADAPTER UNIT 1A6A8					
1	XA1	14	TB1	3	4, See figure 5-45D
2	XA1	15	TB1	4	4, See figure 5-45D
3	XA1	11	TB1	5	4, See figure 5-45D
4	XA1	6	TB1	7	4, See figure 5-45D
5	XA1	12	TB1	8	4, See figure 5-45D
6	XA1	5	TB1	9	4, See figure 5-45D
7	XA2	14	TB2	3	4, See figure 5-45D
8	XA2	15	TB2	4	4, See figure 5-45D
9	XA2	11	TB2	5	4, See figure 5-45D
10	XA2	6	TB2	7	4, See figure 5-45D
11	XA2	12	TB2	8	4, See figure 5-45D
12	XA2	5	TB2	9	4, See figure 5-45D
13	XA3	14	TB3	3	4, See figure 5-45D
14	XA3	15	TB3	4	4, See figure 5-45D
15	XA3	11	TB3	5	4, See figure 5-45D
16	XA3	6	TB3	7	4, See figure 5-45D
17	XA3	12	TB3	8	4, See figure 5-45D
18	XA3	5	TB3	9	4, See figure 5-45D
19	XA4	14	TB4	3	4, See figure 5-45D
20	XA4	15	TB4	4	4, See figure 5-45D
21	XA4	11	TB4	5	4, See figure 5-45D
22	XA4	6	TB4	7	4, See figure 5-45D
23	XA4	12	TB4	8	4, See figure 5-45D
24	XA4	5	TB4	9	4, See figure 5-45D

TABLE 5-21 WIRE RUNNING LIST (Continued)

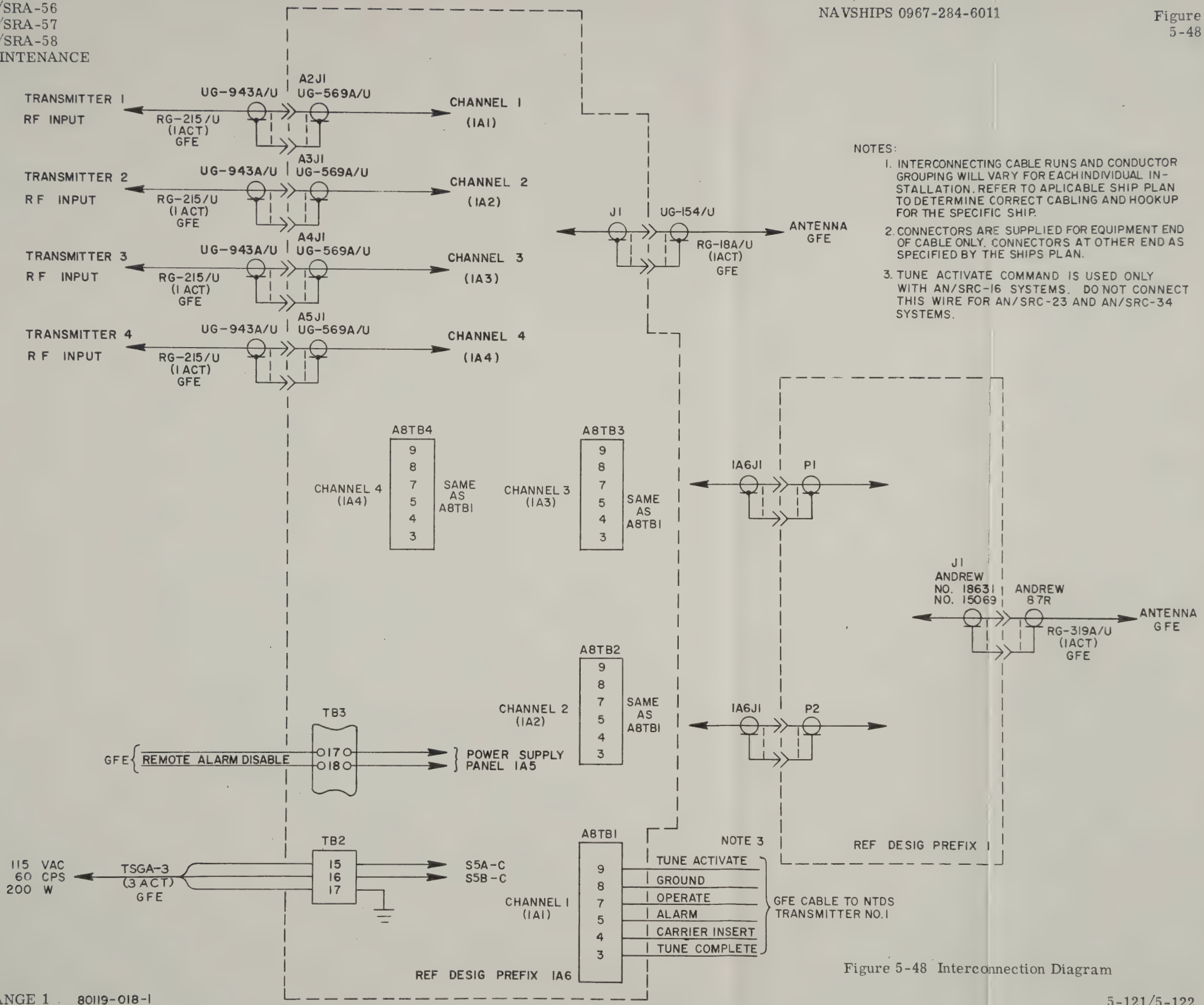
WIRE NO.	FROM		TO		NOTES
	REF. DES.	TERMINAL	REF. DES.	TERMINAL	
NTDS INTERFACE ADAPTER UNIT 1A6A8 (Continued)					
25	XA1	8	J1	A	4, See figure 5-45D
26	XA1	9	P1	A	4, See figure 5-45D
27	XA2	8	J1	B	4, See figure 5-45D
28	XA2	9	P1	B	4, See figure 5-45D
29	XA3	8	J1	C	4, See figure 5-45D
30	XA3	9	P1	C	4, See figure 5-45D
31	XA4	8	J1	D	4, See figure 5-45D
32	XA4	9	P1	D	4, See figure 5-45D
33	XA1	7	TB1	10	
34	XA2	7	TB2	10	
35	XA3	7	TB3	10	
36	XA4	7	TB4	10	
37	XA2	13	XA1	13	2, See figure 5-45D
37	XA3	13	XA2	13	2, See figure 5-45D
37	XA4	13	XA3	13	2, See figure 5-45D
37	XP1	E	J1	E	2, See figure 5-45D



nnection Diagram

TABLE 5-21 WIRE RUNNING LIST (Continued)

WIRE NO.	FROM		TO		NOTES
	REF. DES.	TERMINAL	REF. DES.	TERMINAL	
NTDS INTERFACE ADAPTER UNIT 1A6A8 (Continued)					
25	XA1	8	J1	A	4, See figure 5-45D
26	XA1	9	P1	A	4, See figure 5-45D
27	XA2	8	J1	B	4, See figure 5-45D
28	XA2	9	P1	B	4, See figure 5-45D
29	XA3	8	J1	C	4, See figure 5-45D
30	XA3	9	P1	C	4, See figure 5-45D
31	XA4	8	J1	D	4, See figure 5-45D
32	XA4	9	P1	D	4, See figure 5-45D
33	XA1	7	TB1	10	
34	XA2	7	TB2	10	
35	XA3	7	TB3	10	
36	XA4	7	TB4	10	
37	XA2	13	XA1	13	2, See figure 5-45D
37	XA3	13	XA2	13	2, See figure 5-45D
37	XA4	13	XA3	13	2, See figure 5-45D
37	XP1	E	J1	E	2, See figure 5-45D



NOTES:

1. INTERCONNECTING CABLE RUNS AND CONDUCTOR GROUPING WILL VARY FOR EACH INDIVIDUAL INSTALLATION. REFER TO APLICABLE SHIP PLAN TO DETERMINE CORRECT CABLING AND HOOKUP FOR THE SPECIFIC SHIP.
2. CONNECTORS ARE SUPPLIED FOR EQUIPMENT END OF CABLE ONLY. CONNECTORS AT OTHER END AS SPECIFIED BY THE SHIPS PLAN.
3. TUNE ACTIVATE COMMAND IS USED ONLY WITH AN/SRC-16 SYSTEMS. DO NOT CONNECT THIS WIRE FOR AN/SRC-23 AND AN/SRC-34 SYSTEMS.

Figure 5-48 Interconnection Diagram

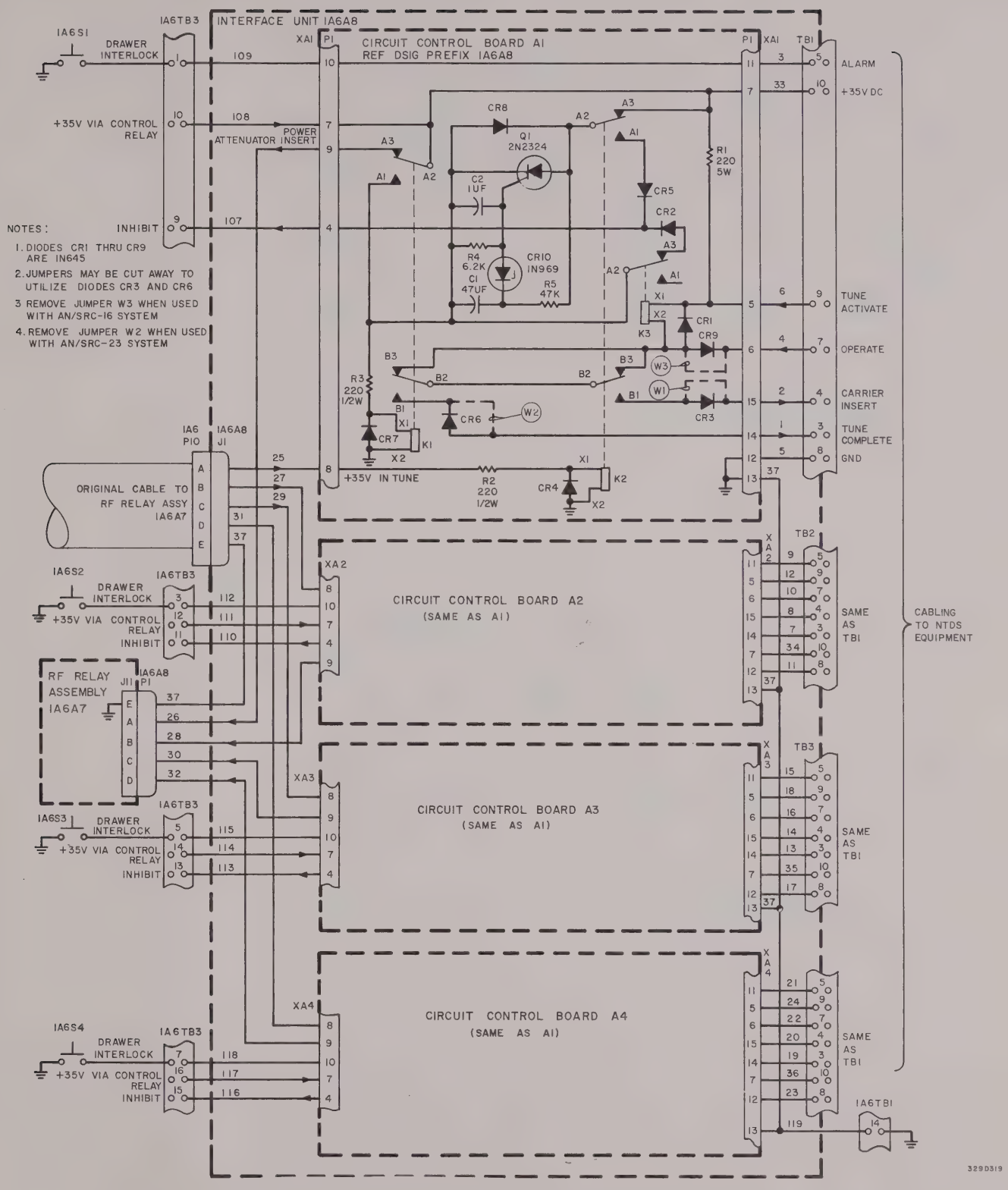


Figure 5-48A. NTDS Interface Unit and Interconnection, Schematic Diagram

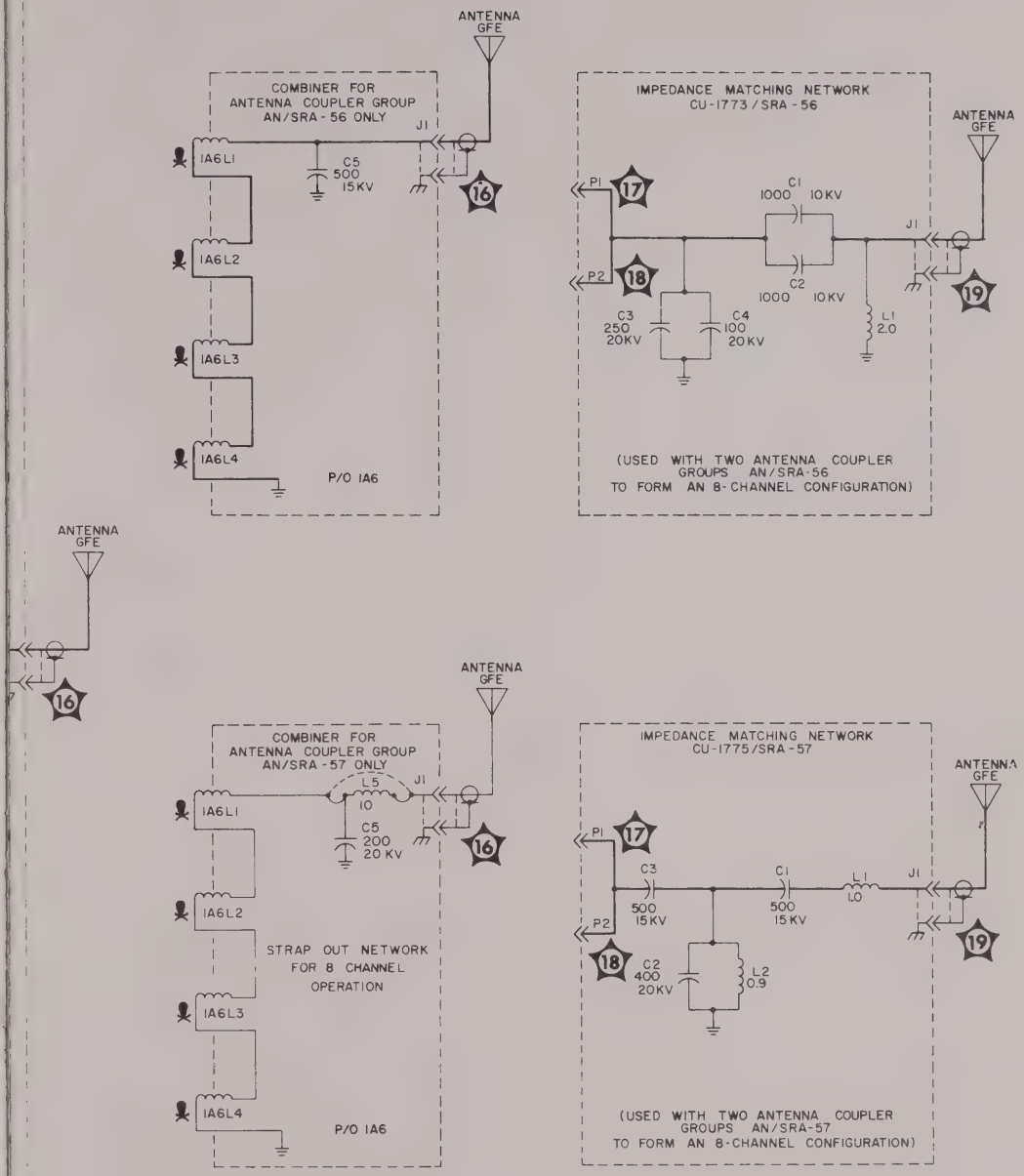


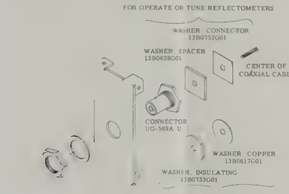
Figure 5-50 Antenna Coupler Groups AN/SRA-56, AN/SRA-57, AN/SRA-56, Schematic Diagram

NOTES:

1. HEAVY LINES INDICATE MAIN SIGNAL (RF) PATH. LIGHT LINES INDICATE SECONDARY SIGNAL PATHS.
2. UNLESS OTHER WISE SPECIFIED, ELECTRICAL VALUES FOR RESISTORS ARE IN OHMS, CAPACITORS IN PICOFARADS, AND INDUCTORS IN MICROHENRIES.
3. MAIN CONFIGURATION SHOWN IS FOR ANTENNA COUPLER GROUP AN SRA-56. SUBSTITUTE APPROPRIATE COMBINER AS SHOWN FOR ANTENNA COUPLER GROUPS AN SRA-56 OR AN SRA-57.
4. WHEN TWO ANTENNA COUPLER GROUPS, AN SRA-57 ARE USED IN AN EIGHT CHANNEL CONFIGURATION, THE COMBINER NETWORK MUST BE STRAPPED OUT.

⚠ SIGNIFIES DANGEROUSLY HIGH VOLTAGE EXISTS WHEN ANY TRANSMITTER IS OPERATING THROUGH THE COUPLER GROUP OR EIGHT CHANNEL CONFIGURATION. KEEP CLEAR WHEN PERFORMING MAINTENANCE IN THIS AREA.

5. DISTRIBUTED CAPACITANCE SYMBOLS AT OPERATE REFLECTOMETER RF INPUT (A6A2P2) AND TUNE REFLECTOMETER RF INPUT (A6A6P2) REPRESENT COMPENSATING CAPACITORS FORMED FROM MECHANICAL PARTS, WASHER (1380753G01) AND SPACER (1380638G01), ASSEMBLED AS IN THE SKETCH BELOW. DISTRIBUTED CAPACITANCE SYMBOLS AT RF RELAY ASSEMBLY RF CONNECTORS (A6A7P1) THROUGH (A6A7J10) ARE COMPENSATING CAPACITORS FORMED FROM MECHANICAL PARTS, WASHER (1380617G01) AND INSULATOR (1380733G01) ASSEMBLED AS SHOWN IN THE SKETCH BELOW.



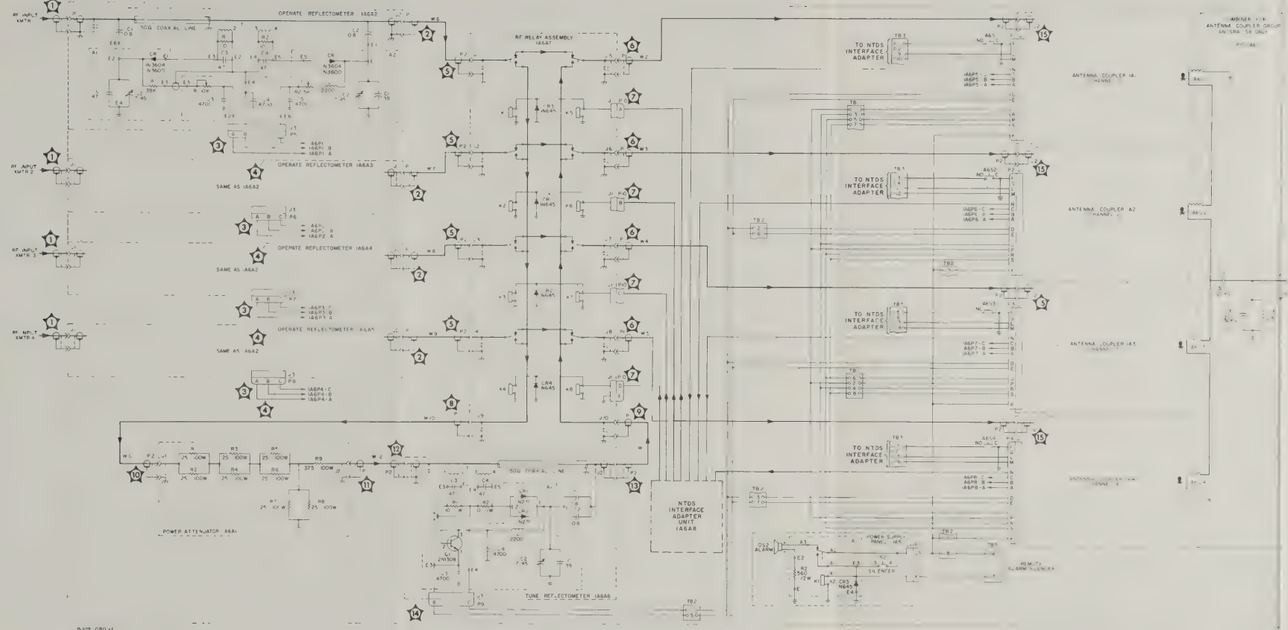


Figure 5-50 Antenna Coupler Groups AN SRA-56, AN SRA-57, AN SRA-58, Schematic Diagram

NAVSHIPS 0967-284-6011

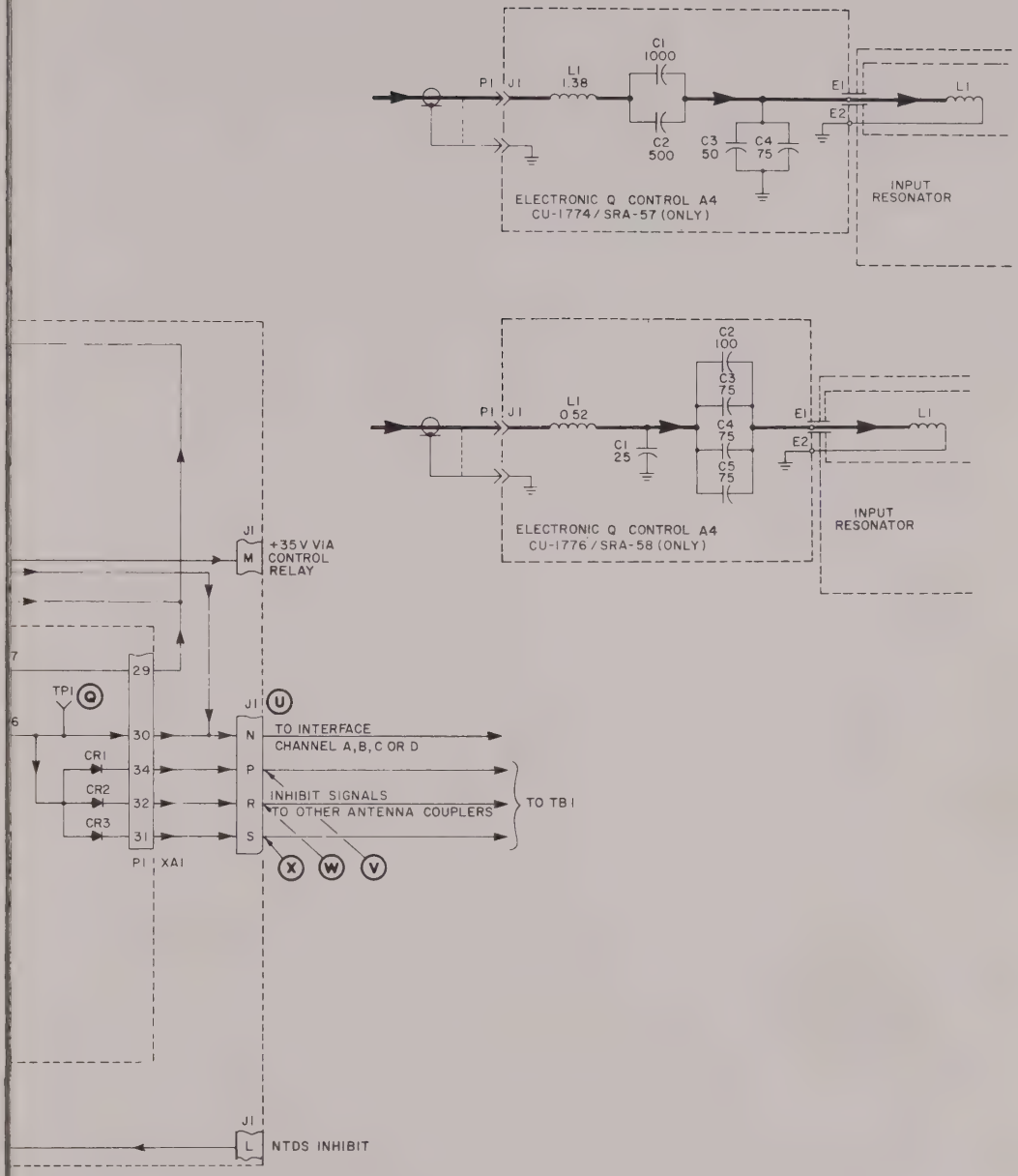


Figure 5-51 NTDS Compatible Antenna Couplers CU-1772/SRA-56, CU-1774/SRA-57, and CU-1776/SRA-58, Schematic Diagram

NAVSHIPS 0967-284-6011

NOTES

1. HEAVY LINES INDICATE MAIN SIGNAL (RF) PATH. LIGHT LINES INDICATE SECONDARY PATHS
2. UNLESS OTHERWISE SPECIFIED, DIODES ARE 1N645. ELECTRICAL VALUES FOR RESISTORS ARE IN OHMS (±5%, 1.2 WATT). CAPACITORS ARE IN PICOFARADS (50 VOLTS), AND INDUCTORS ARE IN MICROHENRIES
3. MAIN CONFIGURATION SHOWN IS FOR ANTENNA COUPLER CU-1772/SRA-56. SUBSTITUTE APPROPRIATE ELECTRONIC Q CONTROL AS SHOWN FOR ANTENNA COUPLER CU-1774/SRA-57 OR CU-1776/SRA-58.
4. VALUES OF INPUT AND OUTPUT RESONATOR INDUCTORS ARE AS FOLLOWS:

CU-1772/SRA-56	L2, L3	6.3 UH
CU-1774/SRA-57	L2, L3	3.2 UH
CU-1776/SRA-58	L2, L3	1.1 UH

VALUES OF INPUT AND OUTPUT RESONATOR CAPACITORS ARE AS FOLLOWS

CU-1772/SRA-56	C3, C4	25-1000 PF, 15 KV, 125 AMPS
CU-1774/SRA-57	C3, C4	20-500 PF, 15 KV, 80 AMPS
CU-1776/SRA-58	C3, C4	10-300 PF, 15 KV, 80 AMPS

OPERATE AND TUNE REFLECTOMETER RETURNS (COMMON) FLOAT ABOVE DC GROUND.

5. OUTPUT COUPLING CONTROL REPEATED FOR CLARITY.
6. SWITCH DECKS A6S1-A1, -A2, -B1, -B2, -C1, -C2 AND SWITCH A6S2 ARE PART OF TUNE OPERATE SWITCH A6S1/S2. SWITCH A6S2 OPERATES ON PUSH TO TUNE.
7. TUNE OPERATE FUNCTION FOR SWITCH A6S1/S2 POSITIONS 11 AS FOLLOWS:

SWITCH A6S1	POSITIONS 1 AND 7	OFF
SWITCH A6S1	POSITIONS 2 AND 8	TUNE-1
SWITCH A6S1	POSITIONS 3 AND 9	TUNE-2
SWITCH A6S1	POSITIONS 4 AND 10	TUNE-3
SWITCH A6S2	(DEPRESSED)	PUSH TO TUNE
SWITCH A6S1	POSITIONS 5 AND 11	OPERATE

8. ⚠ SIGNIFIES DANGEROUSLY HIGH VOLTAGE EXISTS WHEN ANY TRANSMITTER IS OPERATING THROUGH THE COUPLER GROUP OR EIGHT-CHANNEL CONFIGURATION. KEEP CLEAR WHEN SERVICING.
9. ALL CONTROL SYSTEM WIRING CONSIDERED AS PART OF CABLE ASSEMBLY "W1".

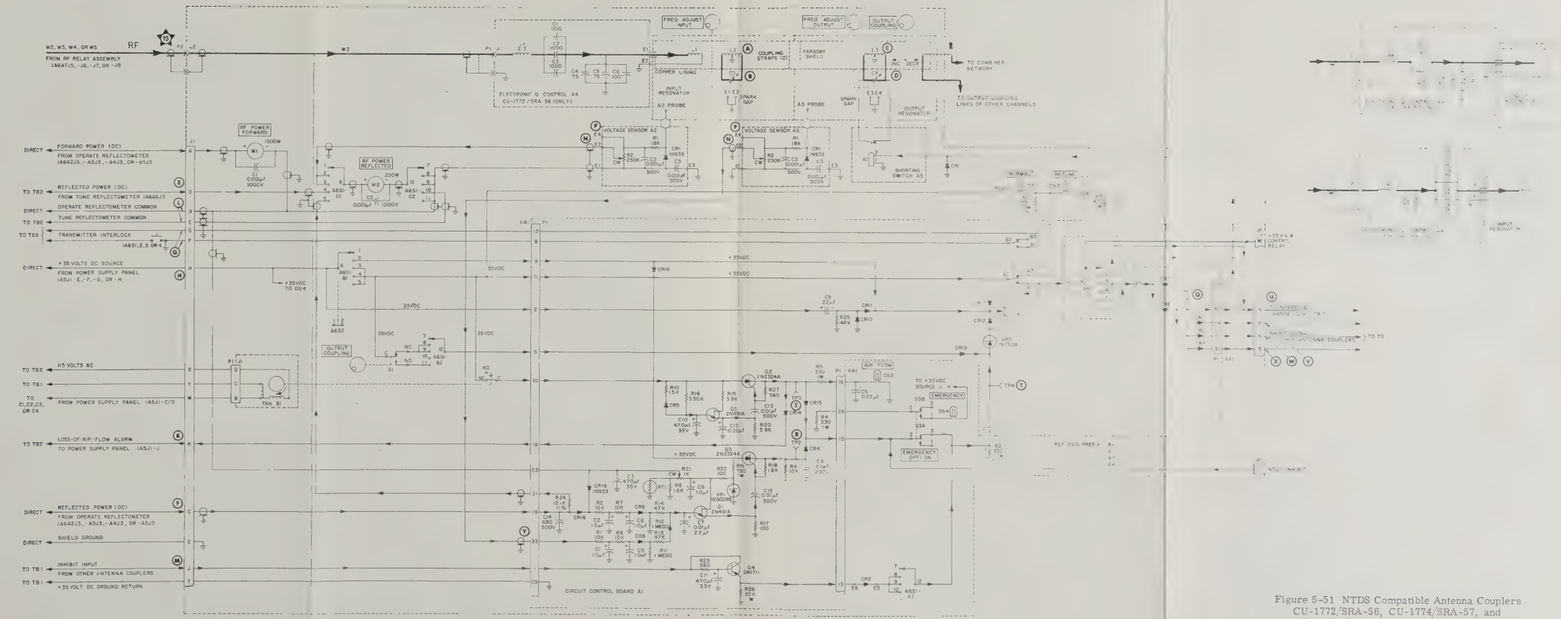

RF
W2, W3, W4, OR W5
FROM RF RELAY ASSEMBLY 1A6A2/3, -/4, -/7, OR -/8
W2
FREQ. ADJUST INPUT
FREQ. ADJUST OUTPUT
OUTPUT COUPLING
ELECTRONIC Q CONTROL A4 CU-1772/SRA-56 (ONLY)
COUPLING STRAPS (2)
FARADAY SHIELD
TO COMBINER NETWORK
COPPER LINING
INPUT RESONATOR
A1 PROBE
A3 PROBE
SPARK GAP
OUTPUT RESONATOR
TO OUTPUT COUPLING LINKS OF OTHER CHANNELS
RF POWER FORWARD
RF POWER REFLECTED
VOLTAGE SENSOR A2
VOLTAGE SENSOR A3
SHORTING SWITCH A5
DIRECT — FORWARD POWER (DC) FROM OPERATE REFLECTOMETER 1A6A2/3, -A3/3, -A4/3, OR -A5/3
TO TB2 — REFLECTED POWER (DC) FROM TUNE REFLECTOMETER 1A6A6/3
DIRECT — OPERATE REFLECTOMETER COMMON
TO TB2 — TUNE REFLECTOMETER COMMON
TO TB3 — TRANSMITTER INTERLOCK 1A6S1, 2, 3, OR 4
DIRECT — +35 VOLTS DC SOURCE FROM POWER SUPPLY PANEL 1A5J1-E, -F, -G, OR -H
+35VDC TO DS4
35VDC
+35VDC
OUTPUT COUPLING
TO TB2 — 115 VOLTS AC
TO TB1
TO C1, C2, C3, OR C4 — FROM POWER SUPPLY PANEL 1A5J1-C/D
FAN B1
TO TB2 — LOSS-OF-AIR-FLOW ALARM TO POWER SUPPLY PANEL 1A5J1-J
DIRECT — REFLECTED POWER (DC) FROM OPERATE REFLECTOMETER 1A6A2/3, -A3/3, -A4/3, OR -A5/3
DIRECT — SHIELD GROUND
TO TB1 — INHIBIT INPUT FROM OTHER ANTENNA COUPLERS
TO TB1 — +35 VOLT DC GROUND RETURN
CIRCUIT CONTROL BOARD A1
AIR FLOW
TO +35VDC SOURCE J1-H
EMERGENCY
EMERGENCY OFF CPA
REF OSC FREQ
TO TB
INPUT RESOUT 1K
OUTPUT RESONATOR
SHORTING SWITCH A5
TO OTHER ANTENNA COUPLERS

Figure 5-51 NTDS Compatible Antenna Couplers CU-1772/SRA-56, CU-1774/SRA-57, and CU-1776/SRA-58, Schematic Diagram

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NOTES	NAMES AND DESCRIPTIONS	FIG. NO.
1A6A7K7	1, 2, 3	Same as 1A6A7K1.	5-29
1A6A7K8	1, 2, 3	Same as 1A6A7K1.	5-29
	1, 2, 3	WASHER, COPPER: mfr 22729 dwg 13B0617G01	5-50
	1, 2, 3	WASHER, INSULATING: mfr 22729 dwg 13B0733G01	5-50
1A6A7L1	2	RF CHOKE: MS91189-37, 100.0 ±10% μH	4-2
1A6A7L2	2	Same as 1A6A7L1.	4-2
1A6A7L3	2	Same as 1A6A7L1.	4-2
1A6A7L4	2	Same as 1A6A7L1.	4-2
1A6A7L5	2	RF CHOKE: MS91189-31, 33 μH	4-2
1A6A7L6	2	Same as 1A6A7L5.	4-2
1A6A7L7	2	Same as 1A6A7L5.	4-2
1A6A7L8	2	Same as 1A6A7L5.	4-2
IMPEDANCE MATCHING NETWORK CU-1773/SRA-56, AND CU-1775/SRA-57			
1C1	4	CAPACITOR, FIXED, VACUUM: mfr 22729, dwg 05D0406G01	5-41
1C1	5	CAPACITOR, FIXED, VACUUM: mfr 22729, dwg 05D0405G06.	5-42
1C2	4	CAPACITOR, FIXED, VACUUM: 1000 pf ±5% 7.5 kv peak, 42 amps, mfr 22729, dwg 05D0406G01.	5-41
1C2	5	CAPACITOR, FIXED, VACUUM: mfr 22729, dwg 05D0405G05.	5-42
1C3	4	CAPACITOR, FIXED, VACUUM: mfr 22729, dwg 05C0507G02.	5-41
1C3	5	Same as 1C1 (Note 4).	5-42
1C4	4	CAPACITOR, FIXED, VACUUM: 500 pf, 10 kv peak, 42 amps, mfr 22729, dwg 05D0405G03.	5-41
1J1	4, 5	CONNECTOR, INNER: mfr 22729, dwg 05C0534G01.	5-40
1L1	4	INDUCTOR, RF: 9 turns of 1/4 O.D. x 0.035 copper tube, mfr 22729, dwg 13D0450H01.	5-41
1L1	5	INDUCTOR, RF: mfr 22729, dwg 13D0422H02.	5-42
1L2	5	INDUCTOR, RF: 0.9 μH, material - 7 turns of 1/4 O.D. x 0.035 copper tube, mfr 22729, dwg 13D0444H01.	5-42
1P1	4, 5	PROBE ASSEMBLY: mfr 22729, dwg 13B0429H01.	5-40
1P2	4, 5	Same as 1P1.	5-40

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF DESIG	NOTES	NAMES AND DESCRIPTIONS	FIG NO.
NTDS INTERFACE ADAPTER UNIT 1A6A8			
1A6A8	1, 2, 3	NTDS Interface Adapter Unit: 4 circuit control boards, 4 circuit control board connectors, 4 terminal boards, 1 connector and 1 plug and cable, mounted in metal case, mfr 97942, Dwg. No. 663R495.	5-45A
J1	1, 2, 3	CONNECTOR, RECEPTACLE, ELECTRICAL: 9 pin miniature connector, mfr 22729, Dwg. 05D0610.	5-45B
P1	1, 2, 3	CONNECTOR, PLUG, ELECTRICAL: 9 pin minature connector, mfr 22729 Dwg. 05D0610.	5-45B
TB1	1, 2, 3	TERMINAL BOARD: mfr 81349, Type 37TB-10.	5-45B
TB2	1, 2, 3	Same as TB1.	5-45B
TB3	1, 2, 3	Same as TB1.	5-45B
TB4	1, 2, 3	Same as TB1.	5-45B
XA1	1, 2, 3	CONNECTOR, PRINTED CIRCUIT BOARD: mfr 95283, Type 600-13PCSCGD 15. mfr 97942, Dwg. 578R681.	5-45D
XA2	1, 2, 3	Same as XA1.	5-45D
XA3	1, 2, 3	Same as XA1.	5-45D
XA4	1, 2, 3	Same as XA1.	5-45D
A1	1, 2, 3	CIRCUIT CONTROL BOARD: Printed circuit board with components assembled for monitor and control operation, mfr 97942, Dwg. 622R725G01.	5-45C
A2	1, 2, 3	Same as A1.	5-45C
A3	1, 2, 3	Same as A1.	5-45C
A4	1, 2, 3	Same as A1.	5-45C
A1C1	1, 2, 3	CAPACITOR, FIXED, ELECTRICAL, mfr 81349, Type CS138F476K.	5-45C
A1CR1	1, 2, 3	SEMICONDUCTOR DEVICE, DIODE: mfr 81349, Type 1N645.	5-45C

TABLE 6-2. MAINTENANCE PARTS LIST (Continued)

REF. DESIG.	NOTES	NAMES AND DESCRIPTIONS	FIG. NO.
NTDS INTERFACE ADAPTER UNIT 1A6A8 (Continued)			
A1CR2	1, 2, 3	Same as A1CR1.	5-45C
A1CR3	1, 2, 3	Same as A1CR1.	5-45C
A1CR4	1, 2, 3	Same as A1CR1.	5-45C
A1CR5	1, 2, 3	Same as A1CR1.	5-45C
A1CR6	1, 2, 3	Same as A1CR1.	5-45C
A1CR7	1, 2, 3	Same as A1CR1.	5-45C
A1CR8	1, 2, 3	Same as A1CR1.	5-45C
A1CR9	1, 2, 3	Same as A1CR1.	5-45C
A1CR10	1, 2, 3	Semiconductor Device, DIODE: mfr 81349, Type 1N969	5-45C
A1K1	1, 2, 3	RELAY, PRINTED CIRCUIT: mfr 81349, Type M5757/9-003.	5-45C
A1K2	1, 2, 3	Same as A1K1.	5-45C
A1K3	1, 2, 3	Same as A1K1.	5-45C
A1Q1	1, 2, 3	TRANSISTOR (SCR): mfr 81349, Type 2N2324A.	5-45C
A1R1	1, 2, 3	RESISTOR, mfr 81349, Type RW74U2210F.	5-45C
A1R2	1, 2, 3	RESISTOR, FIXED COMPOSITE: mfr 81349, Type RCR20G221JS.	5-45C
A1R3	1, 2, 3	Same as A1R2.	5-45C
A1R4	1, 2, 3	RESISTOR, FIXED COMPOSITE: mfr 81349, Type RCR20G622JS.	5-45C
A1R5	1, 2, 3	RESISTOR, FIXED COMPOSITE: mfr 81349, Type RCR20G473JS.	5-45C

TABLE 6-3. LIST OF MANUFACTURERS

MFR. CODE	NAME	ADDRESS
2279	DECO Communications Department, Defense and Space Center, Westinghouse Electric Corporation	Box 551 Leesburg, Virginia 22075
75042	IRC, Inc.	401 North Broad Street Philadelphia Pennsylvania 19108
81349	Military Specification, Promulgated by Standardization Division, Directorate of Logistics Service DSA.	
96906	Military Standard, Promulgated by Standardization Division, Directorate of Logistics Service DSA.	